AVIATION WEEK

JUNE 2, 1952

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50 CENTS

SALUTE TO THE NEWEST TWIN ENGINE TRANSPORT

That's the Convair 340 you're looking at, Consolidated Vultee's new 44-passenger liner now being delivered to seventeen major airlines.*

With a gross weight of 47,000 pounds, she'll enable these airlines to offer the finest twin engine service in history!

At Honeywell we're rather proud of the fact that every 340 built and to be built will be equipped with our *electronic* fuel measurement system, the *really* dependable fuel gauge found in so many types of aircraft today. Because of Honeywell's high engineering, research and material standards, Honeywell electronic fuel gauges have the highest degree of accuracy.

This is only one of many Honeywell products now in use by the aviation industry. We expect the list to grow longer in future years. Because automatic controls are so important to aviation progress. And Honeywell has been the leader in controls for more than 60 years.

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MINNEAPOLIS **Honeywell**

Aeronautical Controls

H CONTROLS

ANOTHER *hytrol* ANTI-SKID BRAKING SYSTEM INSTALLATION

NORTHWEST AIRLINES EQUIPS ITS ENTIRE STRATOCRUISER FLEET

After nine months and more than two thousand hours of service testing, Northwest Airlines has installed Hytrol—Hydro-Aire's Anti-Skid Braking System, on its entire fleet of Boeing Stratocruisers. This fleet installation again proves the importance that is today attached to the Hytrol System. Greater plane availability—up to 50 per cent less tire wear—reduction of non-scheduled tire maintenance—elimination of tire flat spots—decreased landing roll—and the ability for the Hytrol-equipped plane to safely land on an icy runway in a shorter distance—are only a few of the factors responsible for the wide acceptance of Hytrol on fighters, transports, and bombers throughout the world.

HYDRO-AIRE Inc.
BURBANK CALIFORNIA
Subsidiary of Crane Co.

WHAT NORTHWEST SAYS ABOUT *hytrol*

NO MAINTENANCE. Although Hytrol was checked at regular intervals, it required no maintenance... not a single part of it was changed during the entire evaluation program.

SURE, SHORT STOPS. Landings made on icy, slick runways indicated that the plane's landing roll with Hytrol compared favorably with landings made on dry concrete runways under ideal conditions without Hytrol. The frozen runway rolls stopped within 50-200 ft. of the CAA certified field length for dry runways.

KIND TO TIRES. During the nine month test period, not a single tire was removed for flat spots from the Hytrol-equipped Stratocruiser. Not a single blowout was recorded...and no appreciable scuffing was evident.

New B. F. Goodrich tire is first to meet 250 mph landing test

LANDING PLANES at 250 mph speeds will put a terrific strain on the tires. The planes are heavy. The tires must be small to retract into limited space.

B. F. Goodrich set out to design a tire which could meet the *complete* specifications set up by Air Research and Development Command at Wright Air Development Center. The goal of 50 stops at 250 mph on a dynamometer is the toughest ever set for airplane tires. Today's standard tires could not do it. Yet the new B. F. Goodrich tire passed the laboratory test—was still good for even more landings.

After that, the same test tire went on to pass load capacity dynamometer tests at low speeds. Cut apart for a post-mortem, this tire revealed no sign of failure. As a result of passing these tests and meeting all other requirements, the tire won official approval for military production.

New techniques developed for this tire are typical of other B. F. Goodrich tire engineering accomplishments. For example, the first low pressure airplane tire was a B. F. Goodrich development. And the first high pressure tires were built by B. F. Goodrich.

Along with this latest accomplishment, BFG engineers have brought new improvements to their complete line of airline, military and light plane tires. For complete information on tires, brake and wheel assemblies, De-Icers, heated rubber, inflatable seals, and other B. F. Goodrich products for aviation, write *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

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Aviation Week

Member ABC

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CESSNA CASE HISTORIES

JAMES BELDON, HUNTINGTON, W. VA., owner of Belco Dental Laboratory, makes custom bridgework appliances for patients in a 3-state area. He says "direct consultation with dentists would be impossible without my Cessna 170. I haven't time to drive." Roanoke, Va. takes 9 hrs. by car. Beldon flies it in 1 hour, 45 minutes. He also uses his Cessna to attend clinics, conventions, visit metal suppliers, deliver finished jobs, participate in local Civitan activities. He praises Cessna's low maintenance cost and short-field performance, says "the Cessna is so stable it all but corrects my flying mistakes."

ROSS W. FOOTHORAP, BRIDGEPORT, CONN., manufacturer of specialized die sets, says "You can't sell engineering by mail!" In 1949, he bought a Cessna 170, found it so useful for making cross-country sales calls, delivering rush orders, giving customers special service that he recently added a fast Cessna 195! Foothorap says his Cessna 'fleet' has "more than doubled my business, broadened my territory and all but solved my metropolitan delivery problem . . . all for a ridiculously low flying price!" He says his 170 is the "safest ship I've ever flown, the easiest to maintain and costs less than an automobile to operate."

15 Minutes

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Just *fly* the Cessna 170 . . . that's all we ask! Feel how easily she lifts off the ground . . . how instantly she responds to the controls . . . how swiftly and smoothly the service-proved 6-cylinder, 145-H.P. Continental Engine sweeps you along. Enjoy the high-wing visibility and stability, the easy-chair comfort. Then price it — you'll be amazed to discover that the roomy 4-place, all-metal 170 costs only $7245.00 f.o.b. Wichita.

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With New Super-Lift Flaps!

Proved in Korea on the famous Cessna L-19 "Bird Dog" Army observation plane, these remarkable flaps reduce your landing speed more than 10%, give you shorter take-offs. Combined with Cessna's famous patented landing gear they make practical airports of many short, rough fields. And they're *standard* equipment on the new Cessna 170!

Also see the CESSNA 190 SERIES

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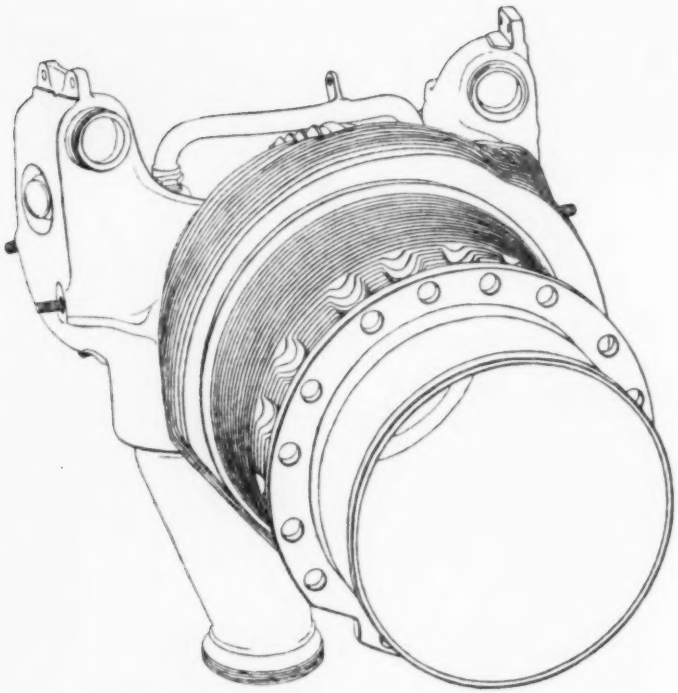

Sound Cylinders . . . AFTER 57 OPERATIONS!

• The cylinders—like every operation of an Airwork overhaul—are done with individual care using special tools and thorough *progressive inspection*. Every detail of the engine's progress through Airwork's modern shop is planned and supervised by men who have infinite pride in their craftsmanship. The dependability of engines overhauled by Airwork is recognized the world over. Scheduled airlines and executive aircraft operators everywhere rely on Airwork's on-time delivery of engines and accessories—convenient exchange plans offered by Airwork save time and money!

From Millville and Miami, Airwork distributes products of the following manufacturers: Bendix Products Division, Bendix Eclipse-Pioneer, Bendix Scintilla, American Brass, B.G., Champion, Continental, Jack and Heintz, Minnesota Mining and Mfg. Company, Packard Cable, Pratt and Whitney Aircraft, Pesco, Turco Products, Thompson Products, Titeflex, Romec, Co-Operative Industries and U.S. Rubber Company.

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"Quality counts at All American! That's why we send our R1830-92 engines to Airwork for major overhaul — Their convenient location at Millville, a scheduled stop on AAA, plus their 'on-time' delivery is of vital importance to our operation."

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NEWS DIGEST

Domestic

Hughes XH-17 giant copter for USAF was moved out of its hangar at Culver City, Calif., last week to resume its testing program. The "flying crane" is powered by two General Electric turbojets and has a single two-blade rotor which measures more than 100 ft. in diameter.

Braniff-Mid-Continent merger plans have been approved by CAB, with the carriers authorized to operate under Braniff's name. Stock exchange would be at the rate of one Braniff share for each 1¼ shares of Mid-Continent. Stockholder approval is still required.

S. M. Treman resigned as general manager of Fairchild Guided Missiles division, Wyandanch, Long Island, effective June 1. It is understood that he intends to organize a business of his own in another field. Paul J. Frizzell, vice president of the Fairchild Engine and Airplane Corp. will temporarily assume active direction of the Guided Missiles division.

Civil aircraft shipments during March came to 248 planes valued at $17.1 million and totaling 825,000 lb. airframe weight. Plane shipments in the first quarter of this year amounted to 699 planes totaling 2,209,200 lb. Civil engines shipped in March came to 405 aggregating 253,800 hp. valued at $3.5 million.

Republic Aviation Corp., Farmingdale, L. I., N. Y., will close during first two weeks in August for annual plant-wide vacation. Republic now employs more than 20,000.

Pay increase of 6½ cents an hour for approximately 22,000 employes at Convair-Ft. Worth has been agreed upon by management and IAM Lodge 776. The increase is retroactive to Dec. 24, 1951, and is subject to Wage Stabilization Board approval.

Brig. Gen. Floyd B. Wood has assumed his new duties as Assistant Deputy for Development, Headquarters, Air Research and Development Command, Baltimore. He previously served as chief of staff, Wright Air Development Center, Dayton.

First Martin 2-0-2 of nine to be overhauled and modified by Temco Aircraft Corp.'s Greenville, Tex., division was delivered to Pioneer Air Lines May 12, with second plane scheduled for delivery the following week. Planes have white-top, heat-resistant paint scheme.

LICENSE TO BUILD Bell helicopters in France is discussed by President Lawrence D. Bell (left) and Jacques Piette, president and director of Societe National de Constructions Aeronautiques du Nord (SNCAN). The French company will build the entire 47D-Q airframe, will get engines from Aircooled Motors, Syracuse, N. Y. License covers military and civil models.

Removal or suspension of price ceilings on services by fixed-base operators is being asked by National Aviation Trades Assn.'s Director Charles Parker, who points out that ceilings have already been suspended for manufacturers of new aircraft and aircraft parts of smaller types used by the operators.

New joint program of the Small Defense Plants Administration and Defense Production Administration provides that a portion of industry expansion to be encouraged by accelerated tax writeoffs will be allotted to small business firms who apply for DDPA amortization certificates.

Financial

Solar Aircraft Co., San Diego, has voted regular quarterly common dividend of 20 cents per share payable July 15 to holders of record June 30, also preferred dividend of 22½ cents a share payable Aug. 15, to July 31 holders.

Northwest Airlines reports $284,337 net profit for April after taxes and adjustments for flood losses and after non-recurring income of $913,000 on sale of equipment. April's operating revenues were $4,272,948. NWA will reduce amount of quarterly payments to be made by carrier in future, following extra payment of $2 million on its loan, reducing current balance to $10,140,363. Instead of $1 million quarterly, NWA will make payments of $835,000.

National Airlines had net profit of $2,006,661 after all charges for nine months ended Mar. 31, with net earnings for three months of $1,322,617. Total operating revenues for the nine-month period were $21,618,728.

The Sperry Corp., N. Y., has declared a 50-cent-per-share quarterly dividend payable June 16 to holders of record June 2.

Rohr Aircraft Corp., Chula Vista, Calif., had sales of $30,013,000 for the nine months ending Apr. 30, with net earnings after taxes being $870,265. Rohr's backlog is $140 million.

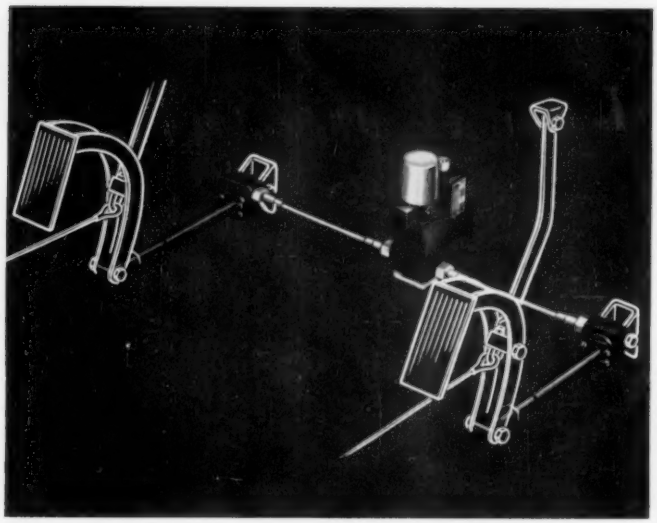
International

Belgian Air Lines (Sabena) has ordered SAAB 91B Safir pilot trainers—reportedly five or six—from de Schelde, Holland, which builds the craft under license from the Swedish firm's Svenska Aeroplan A. B. The Safir is a small low wing, all-metal monoplane with retractable tricycle gear. Powerplant is 190-hp. Lycoming engine. The Dutch licensee now has orders for 75 planes from the Swedish firm, was to deliver its first craft by the end of May.

Canada's highest annual award, the McKee Trophy has been awarded to Phillip G. Garratt, 58, for his work in redesigning British aircraft to meet Canadian needs and for designing three Canadian postwar aircraft. Garratt is managing director of de Havilland Aircraft of Canada Ltd., Toronto.

Inadvertent prop reversal theory in connection with the KLM crash at Frankfurt, Germany (AVIATION WEEK May 19, p. 7), has not been supported by final report of investigators of the Civil Aviation Division of the High Commission for Germany. No evidence of mechanical failure or any other indication of the cause was found. Investigators recommend the probe be reopened if the stewardess recovers sufficiently to give evidence. Original report of prop reversal came from an official military source who indicated the Air Force had conducted the investigation inasmuch as Frankfurt is in the area under U. S. military occupation.

Rudder Pedal Adjustment *AIRBORNE actuated*



An R-622M1 actuator and two R-532 jack screws, connected with flexible shafting, comprise the rudder pedal adjusting system on one of the latest fighter planes.

Long association with the industry and wide experience in the design and development of electro-mechanical equipment for aircraft enable us to meet the rigid requirements of such an application. Let us help you with your problems, too. See our data in the I.A.S. Aeronautical Engineering Catalog.

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I.A.A.C.

AVIATION CALENDAR

June 1-3—Airport lighting conference and seminar, sponsored by American Association of Airport Executives, Deshler-Wallick Hotel, Columbus, Ohio.

June 1-6—Society of Automotive Engineers summer meeting, Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J.

June 3—Council for military aircraft standards, Aircraft Industries Assn., meeting, Hotel Statler, New York.

June 4-6—California Association of Airport Executives & California Aviation Trades Assn. conference, Stockton, Calif.

June 9-13—National Fire Protection Assn. annual meeting, aviation seminar on June 10, Hotel Statler, New York.

June 15-19—American Society of Mechanical Engineers semi-annual meeting, Sheraton-Gibson Hotel, Cincinnati.

June 16-17—Aviation Distributors and Manufacturers Assn. mid-year meeting, The Grand Hotel, Mackinac Is., Michigan.

June 17-19—Aircraft Trade Shows international exhibit of aircraft parts and equipment, Hotel Park Sheraton, New York.

June 19-21—American Society of Mechanical Engineers symposium on shock and vibration instrumentation, Pennsylvania State College, Pa.

June 23-27—American Society for Testing Materials 50th anniversary meeting, Statler and New Yorker Hotels, New York.

June 24-26—Ignition and engine analyzer conference, sponsored by Scintilla Magneto division, Bendix Aviation Corp., Sydney, N. Y.

July 1-3—American Meteorological Society national meeting, including joint session with the Institute of the Aeronautical Sciences, Hotel Statler, Buffalo, N. Y.

July 4-9—Ninety-Nines all-woman transcontinental air race from Santa Ana, Calif., to Teterboro, N. J.

July 8-12—Aviation Writers Assn. annual convention, Ambassador Hotel, Los Angeles.

July 16-18—Institute of the Aeronautical Sciences annual summer meeting, IAS Western Headquarters Building, Los Angeles.

July 18-20—Woman Flyers of America national convention, Chattanooga, Tenn.

Sept. 1-7—Society of British Aircraft Constructors annual display, Farnborough, England.

Sept. 15-19—International Air Transport Assn. eighth annual general meeting, Geneva, Switzerland.

PICTURE CREDITS

7—Bell Aircraft; 9—Boeing; 13—Wide World; 16—Lockheed; 18—BEA; 21—Piasecki Helicopter Corp.; 25—Aero Design; 32—SNCASO; 34—Republic Aviation Corp.; 48—James Montagnes; 55—Howard Levy; 72—McGraw-Hill World News.

Mind Your A's & B's on Stratojets

BOEING B-47B in flight displays the huge underwing auxiliary fuel tanks characteristic of this latest production version of the 600-mph.-plus Stratojet medium bomber.

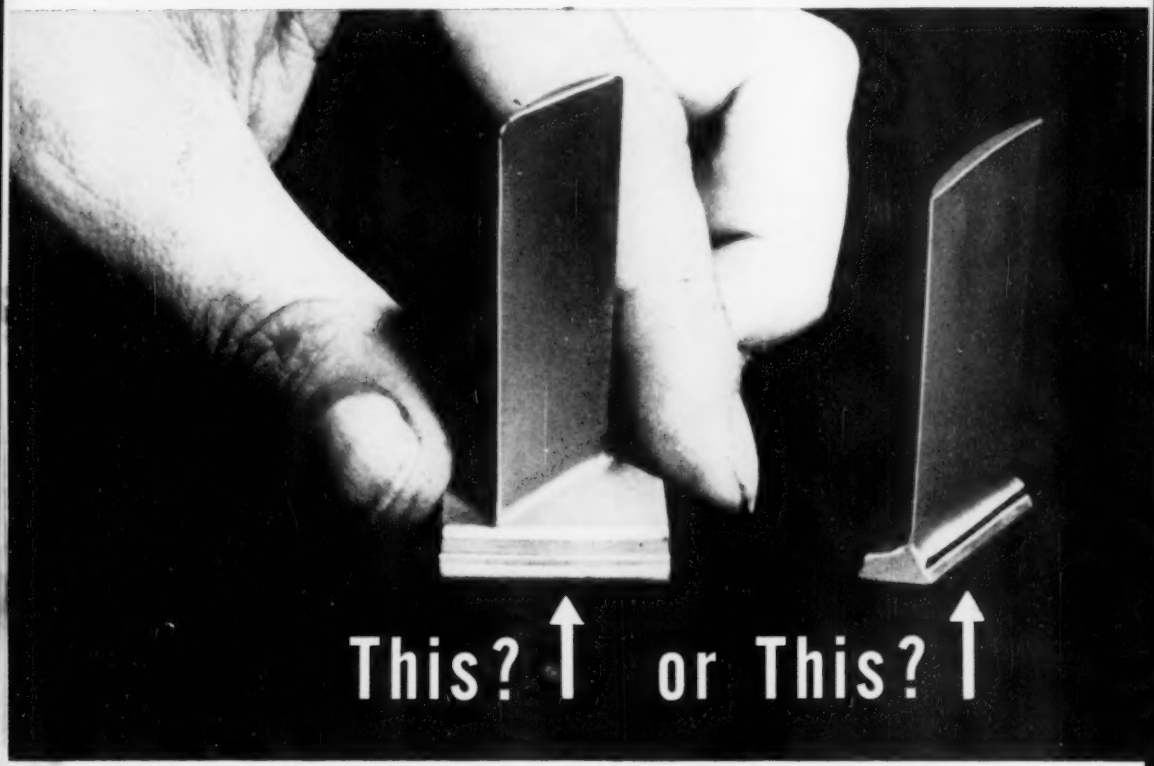
B-47A NOSE CONE is nearly entirely transparent except for small metal disk having narrow braces, whereas newer . . .

B-47B NOSE CONE is more "solid" with visibility provided by smaller window-type panels behind large nose plate.

B-47A TAIL features a pronounced curve visible on top the vertical surface. Also, horizontal tail fairing ends at rudder's trailing edge. The newer . . .

B-47B TAIL can be spotted because top is flattened out and horizontal surface's fairing extends beyond rudder.

Which One Will Save a Million Dollars?



Three years in the making, the fabricated jet engine compressor stator blade (left) promises to save the armed forces not just one million, but millions of dollars annually in jet engine costs, compared with the forged blade (right). This new G-E development will cut manufacturing cost in half and save over a third in critical materials. Military approval has been received for the use of fabricated blades in the General Electric J47-GE-23 which powers the Boeing B-47 Stratojet bomber. And G.E., through the United States Air Force, is sharing the process with other turbojet manufacturers.

The blades are rolled in long strips, contoured to the proper air foil, and cut to desired length. Each blade is then welded into a separate base which fills the same area as the "blade ring" used with forged blades. Thus the ring and an expensive manufacturing and assembly process have been eliminated.

Endurance tests on two engines equipped with the fabricated blades proved them just as efficient as forged blades. The base provides greater resistance to vibration due to uneven airflow through the compressor. Damage caused by foreign objects entering the compressor is minimized because the new blade is fastened much more strongly to the casing.

A product of G-E research at the Thomson Laboratory in Lynn, Mass., this new method of manufacturing stator blades is another of the many ways in which G.E.'s constant pioneering contributes to the advancement of aviation. General Electric, Schenectady 5, N.Y.

213-29

You can put your confidence in—

GENERAL ELECTRIC

WHO'S WHERE

In the Front Office

E. A. Pierce has been named chairman of the board and **H. F. Vickers** made president of The Sperry Corp., N. Y., succeeding **Thomas A. Morgan** who previously held both positions. In other Sperry changes, **John Sanderson** has been designated senior vice president-treasurer. **C. M. Green**, vice president-general manager of Sperry Gyroscope div. and **Kenneth Herman**, vice president-general manager of Vickers, Inc., have also been made vice presidents of Sperry.

Hamilton Migel, previously second vice president and eastern manager of Magnaflux Corp., Chicago, Ill., has been named second vice president-engineering for the firm. New eastern manager is **Roy O. Schiebel, Jr.**, formerly Midwest manager.

Changes

Harold Johnson, formerly chief sales engineer of Weber Aircraft Corp., Burbank, Calif., has been promoted to product development manager, a newly created post.

Rene H. Miller, professor of aero engineering at Massachusetts Institute of Technology, has been appointed director of engineering for Kaman Aircraft Corp., Windsor Locks, Conn.

George D. Ray has been named chief of preliminary design for Bell Aircraft Corp., Buffalo, N. Y. **Lester Fero** takes over Ray's former post as chief structures engineer and **Arthur Schnitt** has been named Fero's assistant.

E. C. Sterling, Jr., has been appointed western division sales manager for Cherry Rivet Co., Los Angeles, recently merged with Townsend Co., replacing **E. H. Stau**, resigned.

R. E. Settle has been named assistant director of engineering at Allison div. of General Motors, Indianapolis.

George H. Bancroft has been made staff representative of Goodyear Aircraft Corp. in the newly formed midwest district of the sales division's subcontract projects department. He will base in Wichita.

C. A. Hofflund has been named to the new position of production superintendent at Lockheed Aircraft Service, Inc., Burbank.

Kenneth T. MacKenzie has replaced **Thomas Holt** as acting sales and service manager for Slick Airways.

Stanley G. Mortimer, Jr., has been appointed advertising manager for Pan American World Airways.

C. S. Hewett has been named operations manager, Atlantic region, Trans-Canada Air Lines, succeeding **F. M. McGregor**, resigned.

Edwin Zak is new superintendent of maintenance for Trans World Airlines in Paris, replacing **J. T. Davis** who is returning to Kansas City for special assignment. **E. E. Cannady** assumes Zak's former K.C. duties.

E. L. Mason has been designated managing director of Aero Industries Technical Institute, West Coast University, Oakland, succeeding **R. S. Steigerwalt**, resigned. **G. K. Forman** has been appointed director of training.

INDUSTRY OBSERVER

(The following column is turned over to the foreign observations of an AVIATION WEEK *editor reporting from London, Frankfurt and Paris.)*

► The era of 10,000-lb. thrust jet engines apparently is here, little noticed and unsung. Bristol's Olympus is well over that figure. European authorities say Pratt & Whitney's J57 is reaching 10,000 lb. and the Armstrong Siddeley Sapphire soon will be at that point. In France, SNECMA's ATAR 101E, still under development, is expected to attain the same rating, and in Sweden Svenske Flygmotor is testing a very high powered jet. Air Force officers in Germany say even the Allison engine in the F-84E (which they call the J35-B-17) develops 7,500 lb. thrust; and that is a fairly old engine.

► U. S. air aid to Yugoslavia is in the form of F-47s, plus technical assistance in training ground crews. We get no bases or other promises in return. Yugoslavia will fight only if Yugoslavia is invaded. Present feeling is that Tito will sit on his hands in case of a Russian push through Germany toward France.

► Quirks in the foreign-aid program: Freight charges on planes shipped abroad in U.S. ships are paid by U.S. If planes are shipped in foreign boats, country receiving the planes must pay, and in dollars. Recently the Danes were holding a batch of F-84s destined for the Dutch because the Dutch were protesting the $7,000-per-plane bill.

► Europeans aren't relying solely on U.S. for aircraft. Denmark has ordered 11 NF-11 Meteor all-weather fighters from Armstrong Siddeley. Night and all-weather fighters are the greatest lack in Europe's air defenses and the Meteor, despite known deficiencies, at least is available.

► Unpublicized aspect of the fuel shortage: USAF planes in Europe have been cut from 35 to 20 flying hours a month in order to conserve the strategic reserve of fuel. Special mission flights have been all but eliminated. Even the courier planes to Berlin were discontinued for a week, then one flight a week was restored in place of the usual three.

► Although plans call for Marcel Dassault's Mystere production to be financed by MDAP funds (Aviation Week May 26, p. 13), Mystere parts fabrication has already started at MD's Bordeaux plant.

► Reason new German airline will not be named Deutsche Lufthansa (AVIATION WEEK May 26, p. 21): too many former employes of Lufthansa are still alive and in Germany. Most of them, particularly the pilots, are too old to go back to work for the new airline, but would be able to claim pensions if the new company was a continuation of Lufthansa. Allied advisors to the German government have requested that the Deutsche Lufthansa company legally be dissolved.

► While U.S. sources claim that VASP, Brazilian airline is ordering more SAAB Scandia twin-engine transports, Swedish informants declare that SAAB has abandoned the Scandia. The company is said to feel that an unpressurized plane no longer can compete; anyway, the Swedish government won't permit SAAB to use men and materials on civilian work.

► British Overseas Airways Corp. and de Havilland apparently have abandoned the proposal to use the Sprite rocket engine on the Comet for "thrust restoration" at high altitudes and high temperatures. BOAC is accomplishing the same end with water-methanol injection in the DH Ghost engines, without the weight penalty that would be incurred by using the Sprites. The rocket engines originally were to be installed in the wing trailing edges between the pairs of Ghost turbojets.

► Some indication of the traffic potential the new German airline will be able to tap is shown by these figures: in 1951, the ten major airline terminals in Western Germany handled 1,060,000 passengers.

► British European Airways' future helicopter plans envision a 50-passenger twin-engine, tandem rotor craft cruising at about 160 mph. and able to do the London-Paris (city-to-city) run in 1¼ hr. It would have stub wings so the rotor could be unloaded for greater speed. Estimated service date: 1960.

Washington Roundup

Aviation's Inconsistency

Aviation industry has alienated some key friends on Capitol Hill whom it may need when the current boom in defense business lets up in two or three years—barring a major war.

Reason: The industry's inconsistency on commercial aircraft development policy. Both air transport and aircraft manufacturing have jumped from one side of the fence to another in a few years; and, all-important from the congressional relations point of view, have overlooked the business of keeping members posted on its shifting position.

The outcome: Representatives and Senators carrying the banner for the industry have looked around and, with surprise and embarrassment, found the industry wasn't behind them—but lined up against them. Some facts from the record:

▶ **Days of Need**—In the 1947-48 postwar slump period, aircraft manufacturers and airlines pleaded with Congress to foster government financing of up-to-date commercial prototypes.

On a measure authorizing the government to put up the cash to stimulate commercial production, industry spokesmen testified:

• **Albert E. Lombard,** military sales manager, Consolidated Vultee Corp.: "The principles expressed in this bill are sound. . . . We feel the bill, if enacted and supported by suitable appropriations, will benefit the nation through improved civil air transports and through strengthened national defense."

• **Robert Ramspeck,** executive vice president, Air Transport Assn.: "The U. S.'s present predominance among the world's aircraft manufacturers and operators is at stake in this legislation. Since the jet transport is clearly the transport of tomorrow, we may well find ourselves, a few years hence, losing the transport market. And lose it we will if a bill like this is not passed, because the manufacturers and the airlines alone cannot undergo the enormous expense involved in financing this development. . . ."

▶ **Less Need**—Economy-minded though it was, the Republican-controlled Congress came within a hairsbreadth of enacting the proposal in mid-1948. Reason it failed: last-minute opposition by aircraft manufacturers, by then getting an ampler diet of military business under the 70-group Air Force buildup.

Maine's Sen. Owen Brewster, former chairman of the Joint Congressional Aviation Policy Board, recalls:

"They came to me hat-in-hand and begged me to do something to get them going. And we got things going. Then they changed their minds—but they didn't tell me about it. I was out in the vineyard continuing to labor for this objective, and secretly they sabotaged me. I think it was a very discreditable episode. . . . I think the least they could have done in decency was to say 'We have changed our minds.' Secret opposition began to appear—while we were fighting and didn't know what was going on. It was unfortunate and very unfair."

▶ **No Need Now?**—Finally, a few months back ATA decided it, too, was against a government program for commercial plane development.

But Rep. Carl Hinshaw and other Representatives and Senators, still pushing legislation in Congress, only found out about the somersault through the medium of the press.

New Kaiser Investigation?

Heat is on for a full-fledged congressional investigation of industrialist Henry J. Kaiser—in particular, his contracts with the Air Force for cargo plane production at Willow Run. House Armed Services Committee is looking into the matter.

Rep. Alvin O'Konski, in a floor speech, said:

• **Production records.** So far, Kaiser-Frazer Corp. has only "assembled" a Fairchild C-119 at Willow Run. "All parts for this plane were actually made at the Hagerstown, Md., plant of Fairchild Engine and Airplane Corp. . . . Kaiser-Frazer just bought the parts, shipped them nearly 1,000 mi., merely assembled them at Willow Run." (Editor's note: This is a common aircraft manufacturing procedure for training assembly line workers.)

Although the firm has not yet come into production on its contract for 150 Chase C-123s, USAF has indicated its intention to the Munitions Board to award a contract to Kaiser-Frazer for an additional 250.

• **Waste of tax money?** Cost to USAF on C-119s will be three to four times as high as at the Fairchild-Hagerstown plant, O'Konski declared. Fairchild can turn out the plane for from $350,000 to $385,000 there, and, "when it was suggested that strategic distribution was the object rather than price, Fairchild offered to produce the plane in Chicago at the same low price." Price from Kaiser: $800,000 to $1,500,000.

• **Extravagant entertaining?** At the dedication of the first C-119 "assembled" at Willow Run, Kaiser-Frazer "lavishly entertained" USAF procurement officers and press in "a great extravaganza" at taxpayers' expense, the Wisconsin representative charged.

• **Business by influence?** "Kaiser manages to suck defense dollars simply by placing his own key men in proper departments of the government."

▶ **Names**—These men were named by O'Konski:

• Former Undersecretary of Air John McCone. "While Undersecretary he was merely on leave of absence from his position of president of Bechtel-McCone Corp. . . . The Bechtel family happens . . . to be holders of 4,200 shares of Kaiser-Frazer common stock. . . . McCone gave Kaiser its first big Air Force order for building 150 Fairchild planes. . . ."

• Clay Bedford "took a leave of absence as vice president of Kaiser-Frazer to become assistant to former Mobilization Director Charles Wilson . . . and still later, special assistant to the Secretary of Defense. . . . Now Bedford is president of Kaiser's Chase Aircraft Corp."

• Warren Huff "took a leave of absence as purchasing agent of Kaiser-Frazer" to become assistant to the administrator of Defense Production Administration.

▶ **Kaiser's Comment:** "Rep. O'Konski has not only been grossly misinformed . . . but has apparently been so stimulated by persons wishing to damage the Kaiser-managed corporations that (he) chose to make his malicious and unfounded statements under the cloak of congressional immunity, so that he could make the remarks without any checks as to the truth.

"The Kaiser interests welcome an over-all congressional hearing, and would further hope that Rep. O'Konski would be a member of the committee, so that he could answer to his constituents, his colleagues, and the people, the source of his statement and the reason he felt justified in making these statements without any check. . . ."

—Katherine Johnsen

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Treaty Spurs New German Air Industry

- **Rebuilt plants seen aid to European rearmament.**
- **But technical poverty may mean long delay.**

By William Kroger

Frankfurt—A mighty, new aircraft production machine to aid U. S. efforts to deter Russian aggression showed the first faint stirrings of life last week.

Signing at Bonn of the German peace contracts with the West made it possible for the once-powerful, technically efficient and creative German aircraft industry to come out from under cover and openly plan the rebirth of German aircraft manufacture. But the start will be small, and for a long time initial contribution to the West's rearmament will be slight.

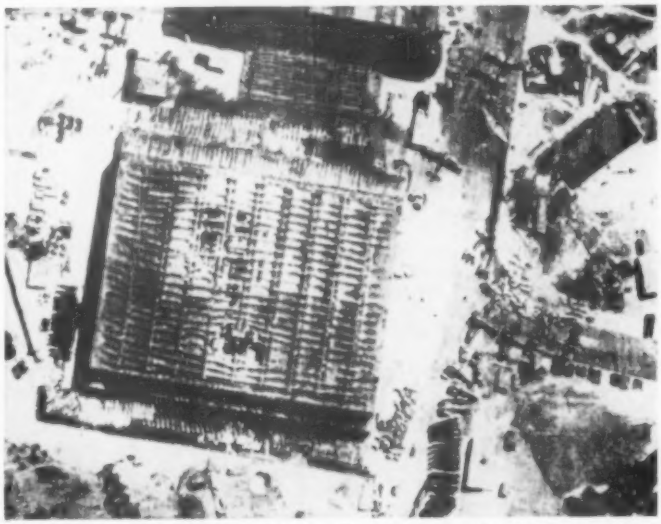
Important to U. S. officials here, who have been seeking ways to turn Germany's industrial capacity to the job of rebuilding Europe's defenses, is the fact the new status of Western Germany under the peace contracts will legalize their secret hopes.

Little can be done firmly until the ratification of the contracts by the legislatures of the countries concerned. But working in favor of speedy action on German aviation are these factors:

- **Immediate need for spare parts** by the Air Force in Europe for C-47 and C-54 transports. Lead time is too long to buy the parts in the States, and there is a shortage there, too.
- **British fears** that present high-level German civilian production will destroy Britain's export market.
- **Low aircraft production** in Britain and France (and also in the U. S. when measured against the need for planes by European air forces), and Germany's reservoir of manpower, materials and skill.

But there are some large debit factors:

- **Technical vacuum** in Germany stemming from utter destruction of Germany's research and technical facilities after the war.
- **Strategic consideration** which may dictate against placing of large-scale parts or equipment contracts in Germany.
- **Political factors** both in and out of Germany, with France naturally fearing a rearmed Germany and with German industrialists themselves reluctant to turn from peace to war goods.



FROM RUINS such as this Heinkel plant at Rostock, German plane builders start again.

In spite of all those cross-currents, definite progress can be reported even this early.

German aviation is starting to rebuild in a familiar manner: with gliders. Two firms in Bremen are producing sailplanes; there are three or four other builders—mostly of the "backyard" variety—farther south in the Western Zone. At least one German plant is making spare parts for USAF planes; several other plants are manufacturing electronic and optical equipment.

▶ **Aviation Poverty**—But the technical void is serious.

In all of Western Germany today, says an observer in a position to know, there is but one complete set of National Advisory Committee for Aeronautics reports. There is no German aeronautical library. The Focke-Wulf factory, famed and feared during World War II for its designs, is building a glider with an airfoil section 15 years old.

After World War II, Germany was swept clean of aeronautical engineering data and kept clean in perhaps the most thorough technological vacuuming in history. Even conceding that German planes were designed as late as 1944, it has been eight years since any German worked with aeronautical research facilities in Germany.

▶ **The Big Names**—So today, Germany's only aeronautical design strength lies in the simple fact that the Allies could not sweep clear the minds of Heinkel, Fiesler, Messerschmitt, Focke and the scores of other top-flight engineers who are still living in Germany. The minds and secret papers of these men could be jam-packed with ideas to be developed when the time is right.

Defeat and occupation did not stamp out the German desire to fly. Just a year ago, when gliding first was permitted, gliders were dug out of haystacks and barn lofts in a dozen places in Western Germany. Their owners said they had been built before or during the war. An American aeronautical engineer who examined most of them believes otherwise.

There is another possible reservoir of German aeronautical technology—the German scientists who have been working with the U. S. and British governments. Whether they want or would be permitted to return to Germany to rebuild the aeronautical industry is a political question.

▶ **Prospects**—An understanding of the prospects for a revived German aircraft industry must be prefaced by an understanding of some of the political, mili-

tary and economic facts of life in Germany today.

The German Federal Republic is an anachronism. It is governed by a president, chancellor and legislature. This government has civil authority over the nearly 50 million West Germans. The republic is "advised" by High Commissioners of Britain, France and the U. S. The third strata of government is the military. West Germany is a conquered, occupied country, actually governed by the military under an occupation statute.

This statute forbids Germany to build aircraft or aircraft engines in whole or in part. The military could well use the assistance of German plants, but is prohibited under the law by which it governs.

▶ **Parts Scarce**—To get C-47 and C-54 parts made in Germany without violating the occupation statute, the Air Force has given a firm named Zarges near Munich a maintenance contract on C-47s. When Zarges needs a replacement, it builds a new part in place on the aircraft. It is slow, but legal.

The Allies have long wanted to replace the occupation statute with a workable system, preferably a free, independent and unified Germany. Russia won't play on the Allied terms, because a peace treaty cannot be signed with half a nation and by only part of the wartime allies. The West has devised "contractual agreements" with Britain, France and the U. S. under which the German Federal Republic agrees to certain conditions in return for full freedom in foreign affairs and an end to the occupation.

(Actually Allied troops will remain in Germany, but as protectors, not as conquerors.)

These peace contracts permit Western Germany to build aircraft. However, it is not that simple.

The contractual agreements, although signed, have to be ratified by the legislatures of the U. S., Britain, France and Western Germany. Little difficulty is expected with the U. S. and Britain. France probably will go along, although reluctantly. The West German Bundestag is a different proposition.

▶ **Want Unification**—More than complete independence, Germans want unification with East Germany, now dominated by Russia. While the contractual agreements are being negotiated, Russia made a new proposal for unification. The Bundestag (the West German legislature) is controlled by Socialists, political opponents of Chancellor Konrad Adenauer who, it is felt here, remains in office only through support of the occupation authorities.

Informed political opinion here believes that the Socialists will block ratification of the contractual agreements until Russia and the West have had a new try on agreeing to unification which would produce a genuine peace treaty and no enforced ties to any country. If unification efforts fail, the Bundestag probably then would ratify the contractual agreements, force Adenauer out of office and seek its own way to attain a unified Germany.

▶ **Aircraft Controls**—Those are only several possible developments in an incredibly complex situation. Their effect on aviation would seem to be that there will not be an uncontrolled German aircraft industry until there is an uncontrolled Germany.

The pall hanging over that possible outcome is that rebirth of a German aircraft and arms industry could be the excuse for Russian military action.

And that injects another element into German hopes for an aeronautical industry. The almost universal belief in Western Germany is that the industrialists will not willingly accept arms orders. Their present civilian production is high and more profitable than arms work would be; in addition, they apparently are genuinely afraid of war.

Their plants were destroyed once because they produced arms; and they share the common belief that in event of war Russia quickly would occupy Western Germany and the industrialists would be charged with war crimes.

▶ **Foundation**—And the factories of these industrialists, of course, would have to be the foundation of a German aircraft industry, supplying it with the metals, machine tools, finished and semi-finished parts.

In contrast to the industrialists, the former prominent German aircraft builders are represented as being anxious to return to their past business. Focke-Wulf, at Bremen, already is building gliders. Ernst Nipp, F-W's former chief of production, has set up a plant in Bremen which was producing aluminum casements for doors and windows, and now has 150 former F-W people working on Germany's first all-metal glider.

The Heinkel plant at Stuttgart has one main factory building containing

U. N. Combat Air Losses: 1,416 Planes

United Nations aircraft losses in Korea have climbed to 1,416 during the 23 months of war against the Chinese Communists since June 26, 1950. Enemy air losses during the same period were 459 (including 319 MiG-15s) destroyed, 123 probably destroyed and 560 damaged.

In mid-May, Air Force reported that Russian-built MiG-15 fighters outgunned North American F-86 and F-84 jet fighters during the week of May 19-24. In battle over MiG-Alley the Red China air force shot down three F-86 and two F-84 fighters and lost four MiG-15 jets.

▶ **Total Score**—The "feud" between the MiG-15 and F-86 fighters, counting total losses, remains on the United Nations' side with 273 MiG-15s lost in combat to the F-86s against 34 F-86s shot down by the MiGs. Combat statistics show that 319 MiGs have been destroyed, 72 probably destroyed and 499 damaged—all in air-to-air combat.

Specifically, Air Force reports that it has lost 56 jet fighters and fighter-bombers in air-to-air combat; 176 to enemy ground fire and 20 from other combat causes. It has lost 16 piston-engine fighters in air-to-air combat; 254 to enemy ground fire and 35 to other combat causes. Total losses due to combat: 559.

Other United Nations aircraft losses thus far are: 4 in air-to-air combat, 45 to enemy ground fire and 11 to other combat causes. Total friendly foreign losses: 60.

Navy aircraft loss reports do not reflect aircraft by engine types nor to the type of loss. Specifically, Navy and Marine Corps report a total of 797 lost to combat causes. Of this number, 351 were lost "due to enemy action"; 446 operational losses. Of this number, Navy stated, 454 were carrier-based and the remainder shore-based Marine Corps craft.

Disparity between Red China and United Nations aircraft losses, Air Force says, is due to the fact that the Red China air force does not fly ground support missions. Virtually all Communist air losses are due to air-to-air combat behind enemy lines.

But the Air Force, Navy, and other United Nations aircraft losses are in large part due to enemy ground fire while our planes fly close support missions in behalf of ground troops at altitudes under 500 ft. Air Force, for example, reports that more than 400 of its aircraft losses have been due to enemy anti-aircraft fire.

United Nations aircraft since the start of hostilities have flown more than 456,465 sorties. During that period they have destroyed: 52,235 vehicles; 9,060 railroad cars; 735 bridges; 1,038 tanks; 775 railroad tunnels; and have accounted for an approximate 169,000 enemy troop casualties.

16,000 sq. ft. Approximately 7,000 sq. ft. is available immediately for aircraft engine work. The factory at present is building automobile engines and precision electronic parts. Heinkel has 800 employes, about 500 machine tools, and wants to overhaul and recondition engines. It figures it could turn out 50 a month. Heinkel had experience building jet engines.

▶**Messerschmitt**—Among the other leading World War II builders, Messerschmitt is building prefabricated houses and has expressed no interest in returning to aircraft. Fiesler is building machinery and reportedly still retains aviation hopes. The BMW engine factory at Munich has been building automobile engines but has been pleading for Air Force Pratt & Whitney engine overhaul contracts. Hirth Motor Company at Stuttgart, a World War II builder of small aircraft engines, wants to resume where it left off.

Some of the equipment firms that have been actively seeking aviation work are Telefunken Radio Company at Munich; Siemens & Hinsch, Hanover, manufacturer of hydraulics; Klein Schanzlin Becker, Kaiserslautern, Germany's largest hydraulics manufacturer, and Amag Hilpert, Nurnberg, pump firm.

These and many other German firms have been hoping to get orders from the Air Force under the "off-shore procurement" program. By and large, it is a vain hope. Right now, such contracts are forbidden by the occupation statute. When and if that is changed, Germany probably will get off-shore business.

▶**Baffling Problem**—But for strategic reasons, no long lead-time items will be ordered from German plants. And, as will be shown in a later story, international politics may rule out large-scale off-shore contracts in Germany.

The economic, strategic and political complexities involved in reviving the German aircraft industry are baffling many Americans attached to the High Commissioner's office here, as well as the Germans themselves. On the surface there is much to recommend helping German aircraft builders.

The Germans perform excellent metal work and are old hands at designing and using machine tools. Labor is cheap and plentiful. There is no metal shortage. Until recently Western Germany was exporting aluminum alloy to the U. S.

▶**Only Surface Factors**—But those are only the surface factors. The tremendous German aeronautical research facilities of World War II are gone. In things aeronautical the Germans of the past were more innovators than copyists. For a long time to come, any aircraft that may come out of Germany likely will lack this stamp of German authenticity.

Heavy Press Program Gains Speed

Alcoa shows its new 15,000-ton press at work; U. S. group expects castings from French and German plants.

By Alexander McSurely

USAF's heavy forge press program for aircraft structures gained impetus in two defense production moves last week:

• An American procurement mission to seek European industrial capacity to make castings for the heavy press program indicated it expected to be able to place a substantial part of the orders sought with French and German firms.

• Meanwhile, at the nation's largest aluminum forging plant at Cleveland, Aluminum Company of America demonstrated its newly installed 15,000-ton forge press, forerunner of two larger giant presses to be installed there under the program.

▶**B-47 Wing Braces**—At Cleveland, onlookers watched the 15,000-tonner mashing hefty aluminum billets into sturdy wing braces for Boeing B-47 bombers at the rate of one every two minutes. Capacity of the press could be speeded up to one a minute, Alcoa officials said, but a lower rate means more precision in forging.

As the onlookers watched, they speculated about the greater sized forgings that the eight giant forge presses now programmed by the USAF will be able to make. The $400-million forge press program includes:

• **Alcoa, Cleveland.** A 50,000-ton Mesta press and a 35,000-ton United Engineering & Foundry Co. press.

• **Wyman-Gordon, Grafton, Mass.** A 50,000-ton and a 35,000-ton press, both built by Loewy Construction Co.

• **Harvey Machine Co., Los Angeles.** A 35,000-ton and a 25,000-ton press.

• **Kaiser Aluminum & Chemical Co., Newark, Ohio.** A 35,000-ton and a 25,000-ton press.

Some idea of the construction programs involved to provide foundations and supplementary equipment for these huge new aircraft tools is indicated by the elaborate preparations to put the much smaller 15,000-tonner at Cleveland to work.

To house the 15,000-ton Schloemann press, one of two of its size built in Germany and brought here after V. E. Day, a five-story structure was required with a foundation of more than 1,000 cu. yd. of concrete. It has a press die table 21 ft. by 74 ft. and in some instances dies for the press will weigh as much as 25 tons.

With auxiliary equipment the press is valued at $6.2 million. Dimensionally it is 22 ft. long, 18 ft. wide, extends 18 ft. below floor level and 36 ft. above. Hydraulic pressure is supplied from 10 accumulator tanks with walls more than 6 in. thick. From these, eight 500 hp. motors pump the water at 100 gal./min. at 4,500 psi.

▶**Pre-heat**—The large pieces of aluminum-magnesium alloy stock which are forged, are pre-heated to 870F., in gas furnaces.

As they emerge from the furnace, the pieces are clutched by the claws of a mechanical manipulator which swings them around and deposits them one by one on the press bed. There isn't any loud hammer blow as the tremendous pressure is applied, but you can watch the round piece of stock flatten out and flow into the shape of the die. Then a fork lift truck lifts out the finished forging and the press is ready for the next piece.

DPA aluminum czar Sam Anderson told AVIATION WEEK early indications are that the European survey trip for capacity to make castings for the new forthcoming presses appeared at least partially successful and that some casting capacity would be available. Extent of the European contracts to be let has not yet been made final.

By comparison with the Alcoa 15,000-ton press, some idea of the future problems of making and shipping the bigger press castings can be gained. When the German Schloemann press was shipped to the U. S. its component parts weighed 1,628 tons, with single castings weighing over 120 tons. The 16 nuts which hold the press together weigh 10 tons each.

The Alcoa press is one of three large forge presses now in use in this country, none of which is as large as any contemplated in the new program. Biggest press in this country now is a Mesta 18,000-ton press operated by Wyman-Gordon. Another 15,000-tonner, also brought from Germany, is installed at Adrian, Mich., in a USAF-owned plant, operated by Bohn Aluminum & Brass Co.

▶**Four Million Lb.**—Alcoa spokesmen at Cleveland said their Cleveland facility is producing about 4 million lb. of forgings a month, about 85% for aircraft. Delivery of another smaller 8,000-ton forge press in about a year, together with a new ringroller and an upsetter, is slated to boost the plant's total forging production past 5 million lb. per month. This includes, of course, the production of smaller presses and forge hammers at the plant.

The big new presses yet to come, the 35,000- and 50,000-tonners will prob-

ably be installed in 1954. First of the presses in the program are due to come through in 1953. Effect of finding substantial foreign capacity for castings, it is hoped, will be to speed the ready dates.

Forge press advocates say that the savings in dies and the ability to make larger single pieces in many ways offsets the high initial cost of the big presses, as against the more traditional American forge hammer production method.

▶ **Pressures on Dies**—In hydraulic press forging the dies are subject only to forming and flow pressures. But in hammer forging the dies are subjected to impact as well as forming and flow pressures. The additional impact pressure cuts the life of the dies and thus increases the cost of this method of forging.

(A two-way or counterblow hammer for ferrous metals is being used by the Ladish Co., Milwaukee, in which two rams come together, causing plastic deformation at a slower rate than in one-way hammer. However, this principle has not yet been applied to aluminum forgings in this country, as far as has been disclosed.)

Air Force Position On Jet Transports

Air Force has long been antagonistic toward legislation authorizing a government-financed program to spur development of new commercial aircraft types —but it's touchy about being accused of being so.

This is the latest example of USAF's attitude:

• On May 9, in an official communication, cleared by Budget Bureau and signed by Assistant Air Secretary E. D. Huggins, USAF went on record as urging postponement of such legislation. Pertinent excerpts from the Huggins letter:

"At the present time such legislation . . . gives concern to the Department of Defense because of the possibility of diverting of the aviation industry's capacity for research, development, and production during the present period of military expansion. As long as the present critical requirements for research and engineering, materials, and facilities exist, any program such as contemplated . . . may seriously affect the aircraft program of the Department of Defense.

"In view of the foregoing, it is the opinion of the department that consideration . . . should be postponed . . .

"This report has been coordinated among the departments and boards of the Department of Defense in accordance with procedures prescribed by the Secretary of Defense. . . ."

• On May 13, Sen. Pat McCarran, testifying before the Senate Interstate and Foreign Commerce Committee, chided USAF for finding "no interest in the development of a jet transport for logistic support that would cut the time for evacuation of wounded from Korea to the U. S. from 36 to 18 hours. The idea prevails that a military transport is supposed to be slow."

• Three days later, USAF's Undersecretary R. L. Gilpatric dispatched a "clarification," misinterpreted in some quarters as a reversal of the military position and support for commercial jet development. He said: "It is my understanding that the position of the Department of Defense is that it generally favors adequate prototype jet transport development at any time that it can be carried on without interference with the critically important military aviation programs.

"Assuming that such interference is avoidable under existing circumstances, it is my personal belief that steps looking toward the development of suitable jet transports for civil aviation could be initiated at this time."

But, as stated in the Huggins letter, Defense Department has assumed that there would be serious interference.

Two other pertinent points:

• The Huggins statement is "official"; Gilpatric's is a "personal" opinion.

• Furthermore, Gilpatric makes it clear that a commercial jet program "should not be justified on the basis of military necessity." And, it's generally presumed that this is the only basis on which Congress would ever approve such a program.

HEADGEAR STYLE NOTE

New type headgear with face visor now worn by well-dressed Lockheed test pilots is modeled (left) by Robert Mayte. Glenn C. Fulkerson wears the old style gear. The visored helmet, designed by Lockheed flight test engineer J. S. Magworth, is custom-tailored to pilot's head measurements. Movable plastic visor shields face and oxygen equipment, filters ultraviolet glare at high altitudes. Facepiece can be raised by lifting knob on front of helmet.

ODM Sets Up New Advisory Committee

Washington aviation observers last week forecast that the Office of Defense Mobilization's new Advisory Committee on Production Equipment still would depend heavily on Defense Secretary Robert Lovett for its actual power, although the committee was moved from the Defense Department to ODM.

Speculation was that the men named to the committee would not continue to serve unless they felt sure their advisory status was directly effective in meeting requirements of the Defense Department.

The committee was set up by ODM to take the place of Defense's Production Policy Advisory Commission (AVIATION WEEK May 12, p. 13).

▶ **On Committee**—Dr. John Steelman, acting ODM director and assistant to President Truman, notified Lovett:

"Since the new group can perform most of the functions which we had originally planned for the Production Policy Advisory Commission it will not be necessary to complete the establishment of that group."

Actually the ODM committee took over the personnel selected for the earlier commission and includes Harold Vance, chairman and president of Studebaker Corp., chairman; Clay Bedford, president of Chase Aircraft, Inc.; Manly Fleischmann, retiring DPA Administrator, and Lt. Gen. K. B. Wolfe, Ret., former USAF Deputy Chief of Staff, Materiel. Charles Stauffacher, ODM staff director, who had been secretary of the short-lived commission, will fill the same job for the committee.

Next, to be sure there was no mistake about who was boss, Dr. Steelman issued another order creating an Interagency Committee on Production Policy headed by the DPA Administrator. This post is to be filled by Henry Fowler who also is presently serving as NPA Administrator.

▶ **What It Means**—Steelman's order provided that Vance's ACPE "shall function as a subcommittee of the Interagency Committee on Production Policy," where presumably its members would advise the representatives of the 11 agencies named as committee members, and other agency members participating in deliberations affecting their agency's interests.

And what did it all mean?

Aviation industry observers saw it mainly as a struggle between opposing official groups for defense production controls, and a move to get these controls back to ODM and DPA, counteracting Defense Department's effort to concentrate them in the commission. It looked as if Steelman, with President Truman's backing, had won.

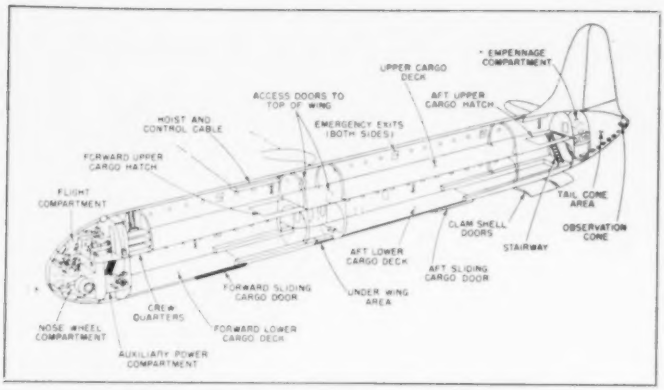
Munitions Board Report on Prime Contracts

Ten firms participating in the U. S. military aircraft program have received $11.5 billion in defense contracts —or 26.2% of the total dollar volume of defense business since the outbreak of war in Korea.

They are, in order of rank as to the volume of defense work: General Motors Corp., United Aircraft Corp., Douglas Aircraft Co., General Electric Co., Lockheed Aircraft Corp., Boeing Airplane Co., Chrysler Corp., Grumman Aircraft Engineering Corp., North American Aviation, Republic Aviation Corp.

Following are aviation concerns figuring in Munitions Board's report on the 100 companies ranking highest in volume of military prime contracts received from July, 1950, through December, 1951.

Rank	Company	Volume of Contracts (In millions of dollars)	Percent of Total
1.	General Motors Corp. (Includes contracts with: AC Spark Plug division; Allison division; Broad-Brook Co.; Cleveland Diesel Engine division; Delco-Remy division; Detroit Diesel Engine division; Fisher Body division; Fisher Lbr. Corp.; Frigidaire division; Frigidaire Sales Corporation; New Departure division; Fernstedt division.)	$2,987.2	6.6
2.	United Aircraft Corp. (Includes contracts with: Chance Vought Aircraft div.; Hamilton Standard division; Pratt & Whitney Aircraft division.)	1,533.8	3.5
4.	Douglas Aircraft Co., Inc.	1,022.7	2.3
5.	General Electric Co. (Includes contracts with: Carboloy Company, Inc.; General Electric Appliances, Inc.; General Electric Medical Products Co.; General Electric Supply Corporation; General Electric X-ray Corp.; Hotpoint, Inc.; International General Electric Company, Inc.; Locke, Inc.; Telechron, Inc.; The Trumbull Electric Manufacturing Co.)	976.8	2.2
6.	Lockheed Aircraft Corp. (Includes contracts with Aerol Co., Inc.; Lockheed Air Terminal, Inc.; Lockheed Aircraft Service International Inc.)	974.9	2.2
7.	Boeing Airplane Co.	939.9	2.1
8.	Chrysler Corp. (Includes contracts with: Airtemp Construction Corporation; Chrysler Airtemp Sales Corporation; Farco Motor Corp.; Plymouth Motor Corporation.)	876.3	2.0
9.	Grumman Aircraft Engineering Corp.	855.7	2.0
10.	North American Aviation, Inc.	738.0	1.7
11.	Republic Aviation Corp.	715.0	1.6
12.	Westinghouse Electric Corp.	674.4	1.5
14.	Consolidated Vultee Aircraft Corporation.	530.0	1.2
15.	Curtiss-Wright Corp. (Includes contracts with: Marquette Metal Products Co.; Wright Aeronautical Corp.)	526.9	1.2
16.	Ford Motor Co.	519.7	1.2
17.	Sperry Corp., (The) (Includes contracts with: Vickers, Inc.)	479.0	1.1
18.	Bendix Aviation Corp. (Includes contracts with: Bendix-Westinghouse Automotive Airbrake Company; Eclipse-Pioneer division; Eclipse Machine division.)	473.4	1.1
20.	Goodyear Tire & Rubber Co., (The) (Includes contracts with: Goodyear Aircraft Corporation; Goodyear Synthetic Rubber Corp.; The Kelly-Springfield Tire Company; Windsor Manufacturing Corp.)	303.2	0.7
21.	Northrop Aircraft, Inc.	296.3	0.7
22.	Fairchild Engine & Airplane Corporation (Includes contracts with: Stratos division.)	273.1	0.6
26.	Martin, (Glenn L.), Co., (The)	220.4	0.5
27.	Radio Corp. of America (Includes contracts with: RCA Communications, Inc.; RCA Service Co., Inc.; RCA Victor Distributing Corp.; Radiomarine Corporation of America.)	211.3	0.5
28.	McDonnell Aircraft Corp.	209.5	0.5
29.	Hughes Tool Co. (Includes contracts with: Hughes Aircraft Co.; Hughes Gun Company.)	205.5	0.5
30.	Firestone Tire & Rubber Company, (The). (Includes contracts with: Firestone Industrial Products Co.; Firestone Steel Products Company.)	193.5	0.4
32.	Willys-Overland Motors Inc. (Includes contracts with: Willys-Overland Export Corp.; Wilson Foundry & Machine Co.)	192.4	0.4
33.	Avco Manufacturing Corp. (Includes contracts with: Crosley division; New York Shipbuilding Corp.)	184.6	0.4
34.	Studebaker Corp., (The)	182.9	0.4
35.	Allis-Chalmers Mfg. Co.	177.5	0.4
37.	Packard Motor Car Co.	177.0	0.4
38.	Bell Aircraft Corp.	168.0	0.4
40.	Philco Corp. (Includes contracts with: Lansdale Tube Company.)	160.7	0.4
42.	Raytheon Mfg. Co. (Includes contracts with: Belmont Radio Corporation.)	152.7	0.3
45.	Continental Motors Corp. (Includes contracts with: Continental Aviation & Engineering Corporation; Gray Marine Motor Co.; Wisconsin Motor Corporation.)	126.1	0.3
50.	Piasecki Helicopter Corp.	102.2	0.2
53.	Kaiser-Frazer Corp. (Includes contracts with: Chase Aircraft Co.)	97.9	0.2
60.	International Business Machines Corporation	90.5	0.2
64.	Emerson Electric Mfg. Co., (The)	84.2	0.2
67.	Nash-Kelvinator Corp.	79.5	0.2
77.	Goodrich, (B. F.), Co., (The) (Includes contracts with: The Akron Rubber Company.)	65.4	0.2
82.	E. I. duPont de Nemours & Co. (Includes contracts with: Remington Arms Company, Inc.)	60.9	0.1
87.	Gilfillan Brothers, Inc.	53.3	0.1
88.	Beech Aircraft Corp.	52.4	0.1
91.	Minneapolis-Honeywell Regulator Company	48.6	0.1



CUTAWAY drawing shows cargo areas of XC-99 and access ports to various compartments.

XC-99 Sets Air Cargo Records

In the past nine months one USAF airplane has flown approximately 5 million ton-miles carrying equipment and supplies, nearly half of which saw service in direct support work in the Korean airlift.

In accomplishing this herculean task, the airplane, the only one of its kind and the largest operational aircraft in the world—the Convair XC-99—has flown nearly 600 hr. and has airlifted approximately 7 million lb. of cargo. Included were 65 long flights of more than 1,500 mi. each, and some 50 flights under 1,500 mi. Direct flight costs of the airplane are quoted at less than 3 cents a ton-mile.

► **Texas Operation**—Data on this unusual cargo operation, conducted by San Antonio Air Materiel Area, headed by Maj. Gen. Clements McMullen, has been made available to AVIATION WEEK as a report on the evaluation SAAMA is conducting out of its Kelly AFB, Tex., headquarters.

Chances are that there will never be another XC-99, but USAF expects to apply lessons learned from its operation to development of other big 100,000-lb. payload long-range turboprop transports of the near future. And on the basis of facts already learned, it appears clear that more powerful, huskier, higher-speed military transports of this capacity can pay big dividends in efficiency.

The six-engine XC-99 made its first flight at San Diego in November, 1947, and was accepted by USAF May 26, 1949. It later was refitted with Wasp Major powerplants, R4360-41 version rated at 3,500 hp., at Kelly AFB. On Sept. 6, 1950, it began its operational evaluation program.

► **Sister of B-36**—Col. Theodore W. Tucker, deputy for operations at SAAMA, was named project officer and chief pilot of the evaluation because of his earlier experience as a pilot of the transport's sistership, the Convair B-36 bomber.

Before the project started, the plane had made a cargo record when it airlifted a useful cargoload of 101,266 lb. 1,150 mi. from San Diego to Kelly. The load included 10 R4360-41 engines and 16 of the 19-ft. diameter Hamilton Standard propellers used by the B-36 and the XC-99.

In the first three months of evaluation the plane flew 150 hr. and demonstrated its ability to operate from moderate length runways. It landed with a full load on a 5,900-ft. runway at McChord AFB, Wash. It took off with a maximum payload (104,000 lb.) from a field with more than 5,000-ft. elevation. In one nonstop flight, the airplane lifted the complete ground equipment of a full tactical fighter wing from coast to coast.

XC-99 Data

Following are data for one month's operation (January, 1952) of the XC-99 USAF heavy cargo transport:

Number of cargo flights	15
Hours flown	117 hr. 15 min.
Total cargo carried	1,123,000 lb.
Ton-miles flown	820,582
Av. loading time per 10,000 lb. cargo	54 min.
Av. man hours to load 10,000 lb. cargo	9 hr. 36 min.
Av. man hours to offload 10,000 lb. cargo	5 hr. 54 min.
Direct flight cost per ton-mile	$0.29

► **New Loading Method**—Finding the standard loading method for smaller transports inadequate, new techniques were worked out, including that of backing the airplane with its propellers in reverse pitch.

In the first six months of 1951, the plane underwent other modifications: sealing fuel tanks, beefing up main landing gear, replacement of the internal powerplant with a higher powered air-cooled engine, installation of a self-traversing system for upper deck hoists and installation of a cargo elevator.

The transport returned to service last July under direction of Capt. James M. Pittard, Jr., project officer, and a military flight crew trained by the civilian crew which had previously manned the XC-99. The big plane has been operating steadily on cargo runs since.

In April, pre-loaded cargo bins made at Kelly AFB were included for small, high-density, high-priority packages to be packed on the top deck. Lower deck is reserved for larger items such as engines, which are loaded by cargo hoists or fork lifts in usual cargo practice and tied down.

► **Fast Loading**—Experience with the pre-loaded bins has been so good that it is estimated that a 100,000-lb. capacity cargo plane designed originally for such a bin arrangement could be loaded fully in less than 30 min. Loading a single bin into the XC-99 takes less than 4 min. Top deck will take 13 bins, each with a 4,000-lb. cargo capacity. Loading time for the XC-99 is now a little over 3 hr.

Bins are hauled to the airplane on a trailer, placed under loading hatch, raised by the aircraft's electric hoist, traversed into position and fastened down by tightening four bolts in the floor.

The XC-99 has a gross weight of 322,000 lb. fully loaded. Double-deck fuselage is 182 ft. long, has 16,000 cu. ft. usable cargo space. Fuselage cross section is 20 ft. high, 14 ft. wide. With 21,000-gal. fuel capacity, the XC-99 has a range of over 8,000 mi. and an operational top speed over 300 mph.

Normal flight crew includes eight: pilot, co-pilot, two flight engineers, navigator, radio man and two scanners.

The latter are stationed on the lower deck in the aft section to scan operation of engines, flaps and landing gear, and report to the pilot, who cannot see them in operation from the flight deck. The 230-ft. span wing is similar to that of the pre-jet B-36s, as are powerplant pusher installations, lower-wheeled landing gear and some of the other components.

Defense Needs More Scrap
Put Your Scrap Back to Work

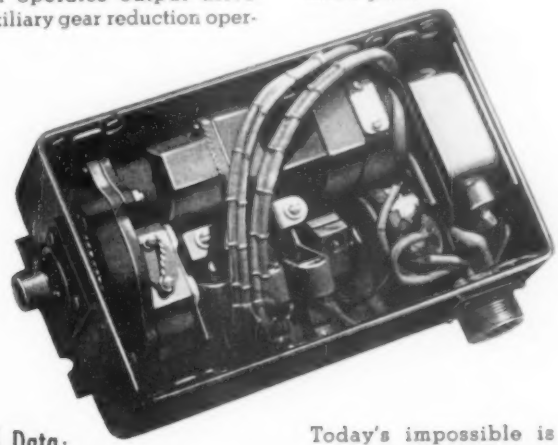
EEMCO technical bulletin

Rotary Actuator Package Advances Automatic Flight

This entirely self-contained rotary actuator package designed and built by EEMCO, combines compactness, high performance, and light weight.

Totally enclosed in a metal box equipped with mounting bracket, it incorporates motor, magnetic clutch and spring-loaded brake. Main gear reduction operates output drive shaft...auxiliary gear reduction operates three adjustable limit switches — two for limiting travel, one for neutral position indication light. Auxiliary reduction also drives potentiometer for position indication.

The unit provides continuous elevator correction on one of the latest jet fighters through the automatic pilot.



Technical Data:

Radio noise filter in accordance with AN-M-40.

Operates in ambient temperature of 250° F.

Output r. p. m. 2500 at 3 inch-pound load. Weight complete — 3¼ pounds.

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El Al Israel Airlines, Ltd.
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Brouwer Building, 176 W. Wisconsin Avenue, Milwaukee, Wisconsin • 582 Market Street, San Francisco 4, California

Aircraft Firms List Executive Salaries

Aircraft manufacturers who have reported 1951 incomes of their officers and directors include:

● **Douglas Aircraft Co., Inc.**—Donald W. Douglas, president and director, fees, salary and commission $127,700, pension, retirement and similar benefits $19,521; F. W. Conant, senior vice president and director, fees, salary and commission $60,947, pension, retirement and similar benefits $4,792; Arthur E. Raymond, vice president and director, $54,311 and $6,837, and Frederick E. Hines, corporation counsel and director, $28,540 and $1,345.

● **United Aircraft Corp.**—Frederick B. Rentschler, director and chairman of the board, aggregate fees and salary $103,950; H. Mansfield Horner, president and director, aggregate fees and salary $103,530, incentive compensation $50,000, and amount paid or set aside under cooperative retirement income plan $7,207; Leonard S. Hobbs, vice president-engineering, and director, fees and salary $73,000, incentive compensation $35,000 and retirement plan $8,729; Raycroft Walsh, vice chairman of the board and director, fees and salary $63,600, incentive compensation $20,000 and retirement plan $9,738.

● **Boeing Airplane Co.**—William M. Allen, president, fees, salary and commission $70,000, awards under incentive and compensation plan**, $9,738 and 147 shares stock valued at $6,762; Wellwood E. Beall, senior vice president, fees, salary and commission $46,665, awards under compensation plan**, $6,492 and 98 shares stock valued at $4,508; Edward C. Wells, vice president—engineering, fees, salary, commissions $37,500, awards under compensation plan**, $5,320 and 80 shares stock valued at $3,680; Fred P. Laudan, vice president—manufacturing, fees, salary, commission $33,335, awards under compensation plan**, $5,004 and 76 shares of stock valued at $3,496; J. E. Schaeffer, vice president-general manager, Wichita, fees, salary and commission $33,335, awards under compensation plan $4,418 and 67 shares stock valued at $3,082; J. O. Yeasting, vice president—controller, fees, salary, commissions $25,835, awards under compensation plan $3,674 and 56 shares stock valued at $2,576. **Awards under the compensation plan for the year 1950 were paid in 1951. Value of the stock was set at $46 with respect to awards made for 1950. Stock received was outstanding stock purchased by company for this purpose.

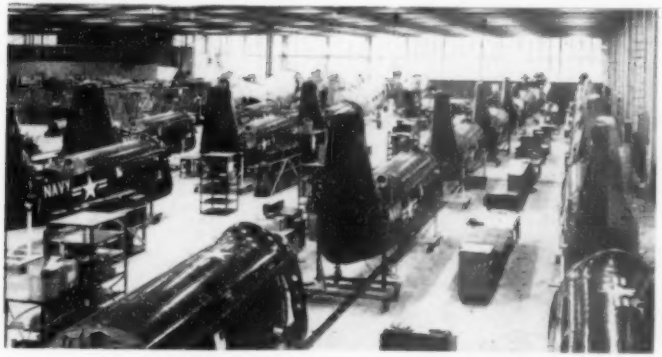
● **Consolidated Vultee Aircraft Corp.**—Lamotte T. Cohu, president, general manager and director, fees, salary and commissions $75,000, retirement payments $10,928; Robert B. Watts, vice president and general counsel, fees, salary, and commissions $37,000, retirement payments $4,202; R. H. Biron, Jr., vice president, fees, salary and commissions $32,500, retirement payments $2,349; W. C. Rockefeller, executive assistant to chairman of the board and director, fees, salary and commissions $31,500.

● **Bendix Aviation Corp.**—M. P. Ferguson, president, director, chairman of the executive committee and member of the retirement committee, salary, directors fee and supplemental compensation $118,500, cost of benefits under pension plan, $7,373; Charles Marcus, vice president, director and member of executive committee, $93,250, pension plan $7,192; R. P. Lansing, vice president, director and member of executive committee, $76,516, pension plan, $5,488; W. H. Houghton, vice president, treasurer, and director and member of executive committee $67,575, pension plan, $4,158; D. O. Thomas, director and president of Bendix-Westinghouse Air Brake Co., $63,300, no pension plan payment; George E. Stoll, vice president and director, $51,475, pension plan $3,396.

● **Fairchild Airplane and Engine Corp.**—Richard S. Boutelle, director and president, fees and salary $66,742, bonus $26,000 and pension, retirement and similar benefits $14,598*; Arthur F. Flood, director, vice president and comptroller, fees and salary $37,950, bonus $19,000 and pension, retirement and similar benefits* $9,257; Willard L. Landers, general manager-aircraft division until 4/4/51, vice president after 4/4/51, fees and salary $35,665, bonus $10,000 and pension plan and similar payments $5,229*. *Pension plan adopted and promulgated subject to approval by Salary Stabilization Board—have been paid conditionally and will be repaid to corporation if plan is not adopted.

● **Beech Aircraft Corp.**—Walter H. Beech, president and director (died 11/29/50), aggregate salary, bonus and fees $8,452; O. A. Beech, secretary-treasurer, president, director**, salary, bonus and fees $84,906; John P. Gaty, vice president, general manager and director, salary, bonus and fees $55,402; T. A. Wells, vice president, chief engineer and director $55,402; Frank E. Hedrick, vice president, coordinator and director $42,139. **Became president after death of Walter H. Beech.

● **Grumman Aircraft Engineering Corp.**—



PIASECKI EXPANDS COPTER LINES

A portion of Piasecki Helicopter Corp.'s new 220,000-sq. ft manufacturing area opened in the middle of April to handle increased HUP and H-21 production shows a number of the craft on the lines. PHC now has more than 500,000 sq. ft. of main plant and satellite factory space devoted to rotary-wing craft output. With opening of the new facility the Morton, Pa., company went back to a 40-hour-week work schedule.

LEWIS
Thermocouple Lead-Wire

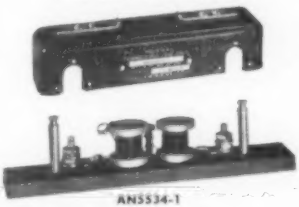
IRON CONSTANTAN — Figure A, lead-wire to specification AN-W-8. Available in type II or III class A or B. Thermocouple wire supplied in AWG sizes from 18 to 30 to Bu Stds RP1080.

COPPER-CONSTANTAN—Figure B, lead-wire used with chromel-alumel indicators, effects considerable saving in weight over chromel-alumel leads of same resistance. Available in AWG sizes or with special stranding to seven ohms per 200 feet.

CHROMEL-ALUMEL—Figure C, lead-wire to specification AN-W-29. Available in types I, II or III class A or B. Available with stainless steel overbraid. Thermocouple wire available in AWG sizes 16 to 24.

Write for data on any of above or wire to new MIL specifications.

ACCESSORIES FOR TEMPERATURE INDICATORS



AN5534-1

Developed by Lewis, the AN5534-1 resistor block is used to adjust the overall external resistance of the indicator to eight ohms.

AN5537-1

Another Lewis development, the AN5537-1 Firewall Connector Block provides a quick disconnect for thermocouple engine leads. Available with angle plugs as part AN5537-2.

TERMINALS FOR THERMOCOUPLE LEADS

In accordance with AN5539 in brass as well as chromel and alumel. In addition, we manufacture chromel and alumel terminals with longer insulation grips in accordance with the new AN5548 standards.

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Photo: Piasecki Helicopter Corp.

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L. A. Swirbul, president and director, fee and salary $60,200, retirement benefits $10,868; L. R. Grumman, chairman of board, fee and salary $50,250, retirement $10,495; William T. Schwendler, executive vice president and director, fee and salary $50,250, retirement $7,637; E. Clinton Towl, vice president and director, fee and salary $32,250, retirement $4,551.

● **Cessna Aircraft Co.**—Dwane L. Wallace, president and director, fee and salary $40,000, bonus $20,000; Frank A. Boettger, secretary-treasurer, fee and salary $24,000, bonus $12,000; Thomas B. Salter, vice president and director, fee and salary $23,000, bonus $11,500.

● **Sperry Corp.**—Thomas A. Morgan, director, chairman of the board and president, salary and fee $126,835, salary adjustment plan $17,600*; Harry F. Vickers, director and senior vice president, salary and fee $86,860, salary adjustment plan* $11,900, retirement pension plan $4,413, retirement annuity plan $12,660; John Sanderson, director, vice president and treasurer, salary and fee $77,050, salary adjustment plan* $10,500, pension plan $5,733, annuity plan $17,006; Thomas B. Doe, director and consultant, salary and fee $51,700, salary adjustment plan* $7,000, pension plan $660. *Salary adjustment plan provides for distribution each year among qualified employes of a salary adjustment fund, maximum amount of which is 10% of consolidated net income for the year, after deducting from such net income a sum equal to 7% of consolidated net tangible assets at beginning of year. Sperry Corp. officers shown received remuneration as director or officer of one or more subsidiaries of the Corp.

● **North American Aviation, Inc.**—James H. Kindelberger, director and chairman of the board, salary and directors fee $125,000, retirement plan $11,452; J. L. Atwood, director and president, salary and fee $85,000, retirement plan $6,400; Raymond H. Rice, vice president, salary and fee $47,878, retirement plan $3,242; R. A. Lambeth, director, vice president and treasurer, salary and fee $39,454, retirement plan $2,736.

● **Republic Aviation Corp.**—Mundy I. Peale, president, general manager and director, fee and salary $78,450, bonus and profit sharing $40,739; Alexander Kartveli, vice president, chief engineer and director, fee and salary $50,640, bonus and profit sharing $29,547; Thomas Davis, secretary-treasurer, fee and salary $20,050, bonus and profit sharing $19,996.

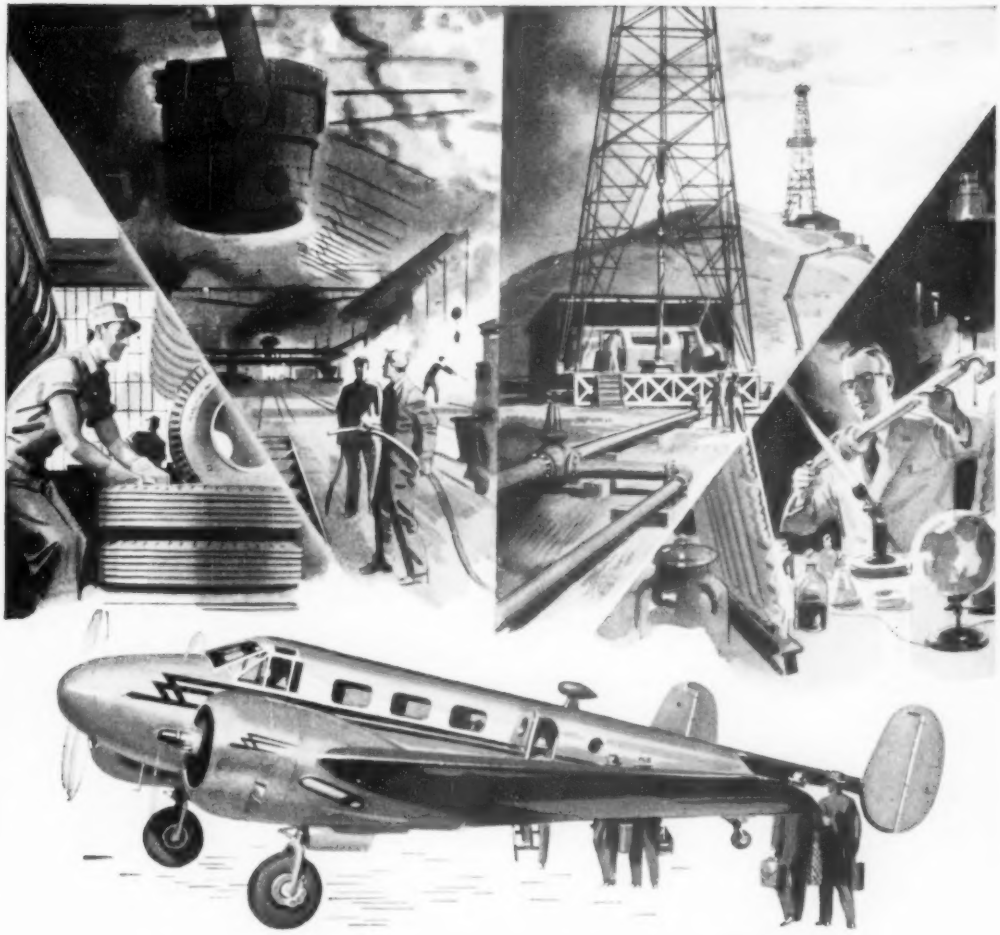
● **Bell Aircraft Corp.**—Lawrence D. Bell, president and director, fee and salary $65,924, pension and retirement payment $16,207; Ray P. Whitman, first vice president and director, fee and salary $43,129, pension and retirement payment $11,246; Julius J. Domonkos, vice president-manufacturing, fee and salary $31,912, pension and retirement payment $4,755.

● **Glenn L. Martin Co.**—Glenn L. Martin, chairman of the board, salary and fee $60,260 pension plan $14,779; Chester C. Pearson, president, general manager and director**, salary and fee $60,260; George T. Willey, vice president-manufacturing and assistant general manager, salary and fee $37,262, pension plan $5,364. **Resigned as president, general manager and director effective 2/21/52.

● **Ryan Aeronautical Co.**—T. Claude Ryan, president, aggregate amount of remuneration $41,624, retirement trust $8,808; G. C. Woodard, executive vice president and treasurer, remuneration $31,958, retirement $4,039.

● **Northrop Aircraft Inc.**—Oliver P. Echols, chairman of the board and general manager, compensation $60,000; John K. Northrop, president and director, compensation $50,000; Roland J. Fagen, vice president, treasurer and director, $28,750; Kenneth P. Bowen, vice president, compensation $28,750; John W. Myers, vice president and director, compensation $27,500.

Get in the Scrap—Turn Yours in for Defense



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When a company-owned Beechcraft turns travel days into travel hours, management's "personal touch" re-enters the picture. When key men travel at 200 mph, they can afford to travel more. Efficiency is higher because management *knows* what's going on. This is why so many Beechcrafts serve America's industrial giants—steel, rubber, oil, chemicals, glass.

Business empire, or "one-man show"—both can profit from Beechcraft speed. For today America has two jobs: pouring forth armaments and keeping the civilian economy rolling. Discover what Beechcraft ownership can do for your business. Call your Beechcraft distributor. Or write Beech Aircraft Corporation, Wichita, Kansas, U.S.A.

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STANDARD "SIX-DIGIT" ENGINE BOLTS

All listed diameters—hex and internal wrenching types. AN specifications.

NAS SHEAR BOLTS

Close tolerance, high strength, flush head type.

NAS INTERNAL WRENCHING LOCK NUTS

Superior safety nuts. Sizes from ¼" to 1½".

NAS INTERNAL WRENCHING AIRCRAFT BOLTS

Latest NAS specifications. Threads are fully formed by rolling after heat treatment

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Both stop and lock nuts. One piece construction, resilient segments lock positively with uniform torque. Aircraft approval, sizes #4 to 1¼" inclusive. Regular steel FLEXLOC approved for temperatures to 550°F.

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AERODYNAMIC CLEANNESS and structural efficiency are combined in Aero Design and Engineering Co.'s light transport, the . . .

Aero Commander: Study in Simple Design

Light transport's highwing gives it good stability and cockpit visibility, with cabin close to the ground.

The twin-engine, highwing Aero Commander, new light transport now in full-scale production at the Tulakes Airport factory of Aero Design and Engineering Co., is a powerful argument for simplicity in detailed design.

The Oklahoma City manufacturer's craft shows an amazing speed ratio of better than 5 to 1—top speed is 211 mph. and power-on stalling speed is 40 mph. or less. And Ted R. Smith, Aero Design's general manager who sparked the original design of the Commander, credits the high performance to the reduction of weight by good detailed design.

From every aspect the appearance of the Aero Commander underscores the careful attention to design detail. From the landing lights recessed into the double curvature of the nose, through the exhaust augmentor system for better engine cooling, to the squared-off tail surfaces, the craft is a happy combination of aerodynamic cleanness and structural efficiency.

▶ **Postwar Efforts**—In 1944 Smith called together a group of ten other technicians and began the design studies that were to lead to the final configuration of the Aero Commander. By the end of 1945 they had reached a satisfactory final configuration and had worked out performance data and the engine installation. Tooling for the prototype was begun early in 1946, and, in August of that year, actual manufacturing began.

The first airplane was completed and test flown Apr. 28, 1948. Behind Smith and his crew was a total of 32,000 man-hours of engineering work alone on the Commander. Their dream had been translated into tangible substance.

But 1948 was not a bright year for aircraft sales. The Aero Commander had a long road ahead of it to production. It was almost three years later before a factory was obtained in which to build the airplane. During that three years, another 10,000 man-hours were spent improving the design and getting it ready for production.

▶ **One-Year Record**—In January, 1951, the company acquired an empty hangar at Tulakes Airport. Slightly more than one year later—on Jan. 30, 1952—the Aero Commander received its Approved Type Certificate from the Civil Aeronautics Administration. The first production airplane, which had flown the autumn before, passed its CAA flight test in three weeks and one day.

Right now the first block of 50 production airplanes is moving through Aero's factory. The 300 employes currently turning out the aircraft will have to be increased in order to meet the planned production schedule of two airplanes a week, says Aero Design. These first 50 airplanes are firm orders, with cash deposits made to insure delivery priority.

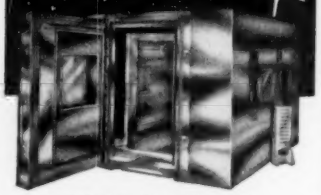
With production aircraft available for demonstration to prospective purchasers, Aero Design expects the backlog of deposit orders to increase steadily. There are 15 aviation sales organizations here and abroad which will handle the distribution of the Commander.

▶ **Description**—The Aero Commander is an all-metal airplane which seats six people. It is equipped with tricycle landing gear, and it is powered by two air-cooled engines driving all-metal constant-speed propellers.

The first thing you notice about the airplane is its highwing. There were three reasons why the Aero Design engineering staff selected the highwing design:

- **Flight stability.** The company says that the Aero Commander has unequalled stability in flight.
- **Cabin close to the ground** could be designed so passengers could step into it with ease. In the Aero Commander you step up only 19 in. from ground to cabin.
- **Advantages of cockpit layout.** With the seat well forward in the wing, the pilot has a full sweep of vision; his position close to the ground makes dis-

Another BOWSER First!!



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HIGH WING means good visibility and low step out of cabin of Aero Commander. Note exhaust augmentor system on outboard side of nacelle, and extremely clean cowling.

tance judgment an easy and accurate job. The pilot is able to see the ground just 11 ft. in front of the nose of the airplane.

Inside the cabin there is unobstructed floor space, and Aero Design has taken advantage of this in a number of special installations such as reclining chairs, lounges, buffet cabinets, and other equipment of executive aircraft.

▶**Large Windows**—Over 23 sq. ft. of windshield and cabin windows give excellent visibility to passengers, pilot and co-pilot. The cabin has been soundproofed with double-thick Fiberglas. The inside of the fuselage skin is covered with a sound deadener, much like the undercoating in today's automobiles. This combination of sound deadener and cabin insulation reduces the noise level inside the cabin to such an extent that normal conversation can be heard.

Just behind the cabin door on the fuselage there is a large access door to a 34-cu. ft. baggage compartment. This is also accessible from the cabin in flight.

A fresh-air cabin heating and ventilating system is provided. The intake scoop for the system is on top of the fuselage and fresh heated air is delivered through vents located for even distribution. There is a blower for cooling the cabin in hot weather. The entire system can be operated on the ground while taxiing as well as when the aircraft is in flight.

With an eye to maintenance, floor panels in the main cabin can be removed for access to control cables. The fuselage baggage compartment gives access to the fuselage aft section and the control system at the rear is reached through fuselage openings on either side under the horizontal stabilizer, or through the removal tail cone.

▶**Powerplant**—Two Lycoming GO-435-C2 engines power the Aero Commander. These engines are rated at 260 hp. each for takeoff and 240 maximum continuous horsepower. Engine cooling is handled partly by efficient cowling and partly by an exhaust augmentor system. The augmentor, which acts as a jet pump, is on the lower outboard side of each nacelle.

Stromberg PS-58D carburetors with automatic mixture control units are fitted on each engine. With this carburetor it is not necessary to lean the mixture manually in climbs to high altitudes. There are only two positions for the mixture controls: Normal and idle cutoff. Just behind the carburetors inside the cowlings are automatic alternate air intakes in the event

Aero Commander Model 520

Specifications

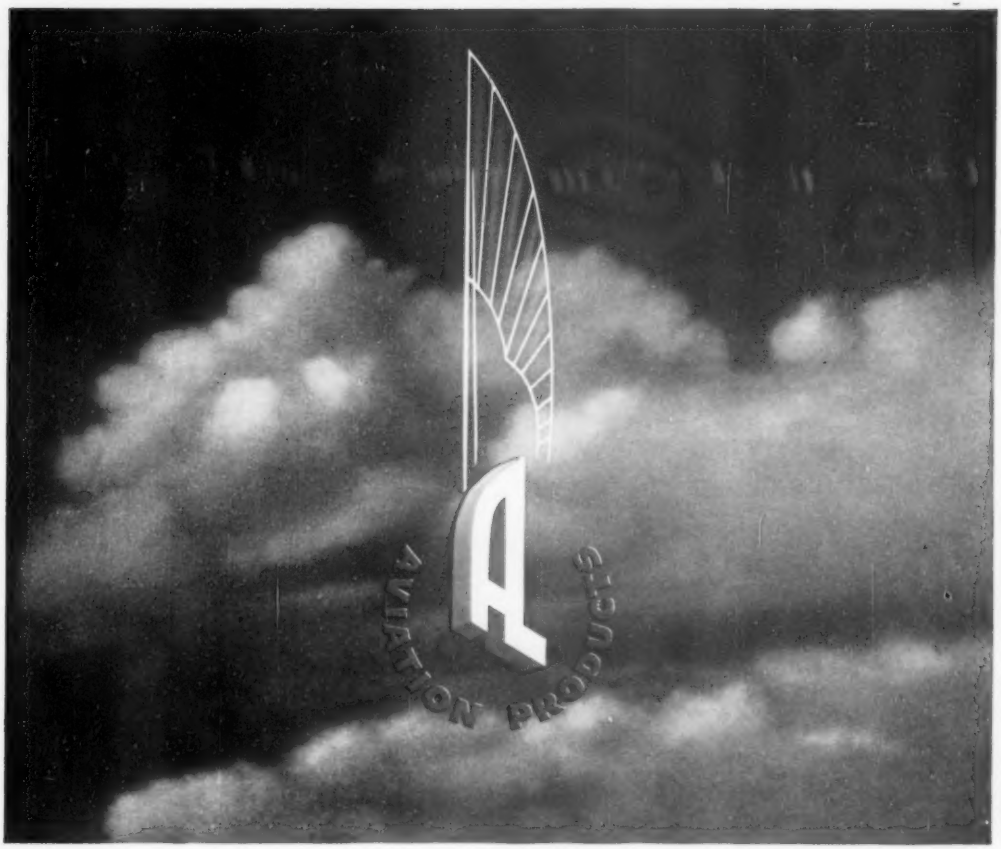
- Airplane gross weight . . . 5,400 lb.
- Airplane empty weight . . 3,600 lb.
- Wingspan . . . . . 44.2 ft.
- Wing area . . . . . 242 sq. ft.
- Length . . . . . 34.2 ft.
- Powerplants: Two geared Lycoming GO-435-C2s rated at 260 hp. each for takeoff, 240 hp. each normal rated power.
- Propellers: Two-blade constant-speed Hartzell props, 88 in. dia.

Performance

(Based on full load gross of 5,400 lb. and guaranteed within ±3%.)

- Max. speed, rated power at sea level . . . . . 211 mph.
- Cruise speed, 70% s.l. power at 10,000 ft. . . . . 197 mph.
- Rate of climb, takeoff power at sea level . . . . . 1,800 fpm.
- Rate of climb, single-engine at sea level . . . . . 600 fpm.*
- Takeoff distance, to clear 50 ft., zero wind . . . . . 950 ft.
- Service ceiling, two engines . . . . . 22,000 ft.
- Service ceiling, single engine . . . . . 10,500 ft.*
- Stall speed, flaps and gear down, sea level . . . . . 60 mph.
- Stall speed, clean condition, sea level . . . . . 67 mph.
- Stall speed, clean condition, power on, s.l. . . . . 40 mph.

* *Dead-engine propeller feathered.*



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that ram air supply should become restricted.

The engines drive Hartzell two-blade constant-speed propellers of 88-in. diameter. There is a full-feathering control which disconnects the propellers from the pitch-control mechanism. Windmilling of the blades turns them to a full-feather position and shears a stop pin in the process. After the propeller has been feathered in flight, it cannot be unfeathered. It is necessary to turn the blades back manually on the ground and insert a new stop pin.

▶**Fuel System**—Five rubber tanks installed in the wings have a capacity of 150 gal. All tanks are interconnected and can be filled simultaneously; there is one filling neck on top of the wing inboard of the right engine nacelle.

Primarily this system has all the characteristics of a single-tank system. There are no cross feeds. Fuel from all four outer panel wing tanks flows by gravity into the center tank. Engine-driven pumps draw gas from the center tank. There are electrically operated fuel shutoff valves at each engine firewall which can be controlled by switches on the pilot's overhead panel control.

A fuel booster pump is located in the lines just at the outlet of the center fuel tank. Fuel quantity is read by electrically operated fuel gages on the instrument panel. The fuel booster pump and all connections are enclosed in a ventilated vapor-tight box which eliminates the possibility of fuel fumes in the cabin.

The lubrication system is a full-pressure wet-sump system incorporated as part of the engine.

▶**Landing Gear**—The Commander uses tricycle landing gear whose components have been previously proven. The main landing gear is of the type used on the BT-13, one of the standard basic trainers of World War II. The nose gear was originally developed by North American Aviation, Inc., for its Navion.

Hydraulic cylinders retract and extend the landing gear. All three gears rotate aft during retraction; main wheels enter the engine nacelles and the nose wheel enters the fuselage nose. Main and nose gear are held in the up position by hydraulic pressure. Hydraulic pressure plus a mechanical down-lock keeps the gear extended.

An indicator on the instrument panel shows the position of each individual gear. The landing gear warning horn is operated by a micro switch and a throttle linkage; the horn sounds when both throttles are closed and the landing gear is not down and locked. Visual indication of landing gear position is shown by green lights on the instrument panel. These lights are on when the gear is down and locked.

▶**Auxiliary Systems**—Flaps, brakes, and landing gear are all operated hydraulically. The system includes an accumulator and an emergency hand pump in the event of power failure in the main system. Hydraulic pressure is 1,000 psi.

The left engine drives a 50-amp. generator which supplies power for the 24-v. d.c. electrical system. The same nacelle contains a voltage regulator and a reverse-current relay. On the left side of the rear fuselage is a special door for battery access; battery slides in and out on special tracks. Circuit breakers provide protection for all electrical components except starters and generator. A special fuse protects the generator and the master fuse protects the starters.

Flight control system of the Commander is a conventional one. Cables and push-rods operate all surfaces. Electrically actuated trim tabs, with indicators on the instrument panel, are installed on elevators and rudder.

Two sealed-beam landing lights rated at 250 w. each are located on the underside of the nose. Instrument lighting is both red and ultra-violet. Special map-reading lights and compass lights are provided. On each side of the cabin there are switch-controlled reading lights and there is a dome light overhead.

No standard radio equipment has been selected in order to allow an owner

Incomparable

a pretty girl

The aisle looks a mile long and, at the end of it, a certain young man suddenly is something of a stranger to our June bride. Lou Prothro had no trouble posing for this picture because, just 14 months ago, she went through it all to become Mrs. Elmore M. Klenk, Jr. He's now on active duty with the Air Force. Lou is 19, has blue eyes, blonde hair. (No. 9 in a series of pretty Dallas girls discovered and photographed especially for Southwest Airmotive).

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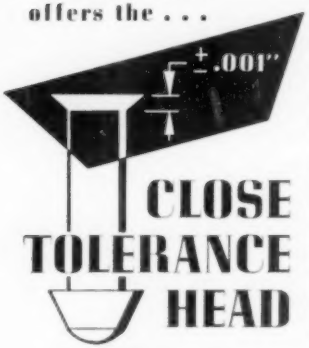

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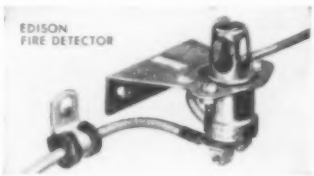

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his personal preference. But space for the installation has been provided so that working parts are hidden and do not mar the interior of the cabin. The amplifier and dynamotor are installed in the fuselage behind the baggage compartment.

▶**Structural Design**—The Aero Commander has been designed for 3.8 positive G and 1.52 negative G load factors for both gust and maneuver conditions at full-gross weight with flaps up. In general the structure is conventional all-metal stressed skin and stringer type.

The major component of the wing is the center section plus the two nacelles, which are permanently attached. The outer wing panels and wingtips are replaceable. The structure is all-metal and uses two spars in a box-type construction. These spars are located at 35% and 67% chord.

Connection between outer panel and center section is a riveted and bolted joint. Rivets join the wing spar webs and skin and stringers between the two sections; bolts join splice members for the spar caps. Ailerons and flaps are all-metal.

Fuselage construction is semi-monocoque, incorporating transverse frames and stiffeners with aluminum alloy sheet covering.

The engine mount is welded steel tubing attached to the wing and landing gear truss with four bolts.

—DAA

Gas 'Cleaner' Betters Jet Energy Use

An experimental exhaust-gas "de-corroder," designed by Ryan Aeronautical Co. to remove contaminating substances from engine exhaust, will be further developed and tested by Ryan under an Air Force contract recently announced. The unit has proven itself on an experimental basis.

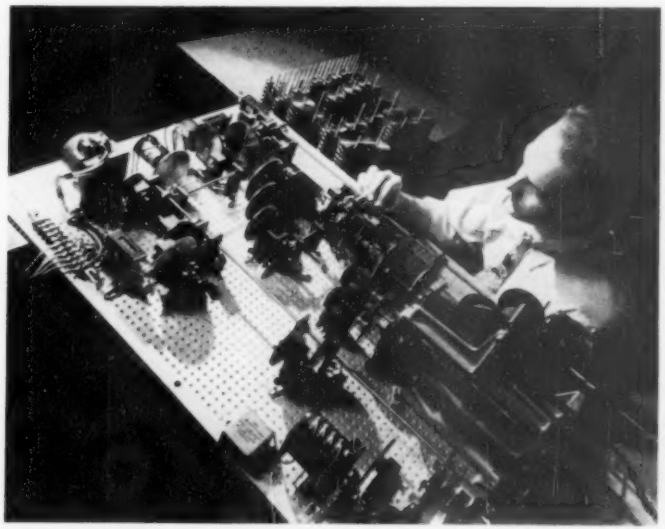
Main reason for a de-corroder is to make better use of the available heat energy in the exhaust stream of an aircraft powerplant.

At the present time, this utilization has one big drawback: Corrosion caused by the gases on aircraft metals such as magnesium and aluminum alloys.

It takes only a relatively few hours for the contaminating chemicals in these gases to penetrate aircraft alloys to ". . . an alarming degree. . . ."

Ryan's device removes the contaminants, and lets the exhaust gases be used in direct contact with aircraft structural materials. This means that lightweight aluminum alloy heat exchangers, ducting and piping may be used instead of the heavier stainless steels, says Ryan.

The new contract will provide for further improvements of the de-corroder and its development for use with both jet and piston engines.



'PUNCH BOARD' SPEEDS INSTRUMENT DESIGN

This metal 3x4½-ft. hole-punched board is used by engineers at NACA's Lewis Flight Propulsion Laboratory, Cleveland, to speed design of special instruments needed in research projects. The parts for a particular instrument are assembled around the board, then are roughly fitted together on the metal panel and secured by bolts. After trial runs to perfect the assembly, measurements are made of the parts to be used.

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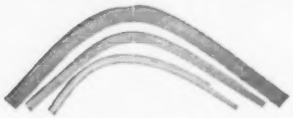

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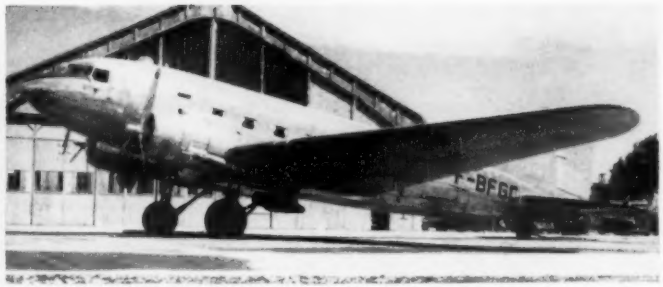


PALAS UNIT under DC-3 belly may get plane French okay for 29,000-lb. gross.

Details of DC-3's Auxiliary Jet

SNCASO reports successful trials with Palas turbojet unit which could extend Douglas craft's useful life.

(*McGraw-Hill World News*)

Paris—SNCASO has released details of its successful flight trials of a Douglas DC-3 fitted with an auxiliary turbojet, which point to the possibility of extending the useful life of the airplane and also permitting more profitable operation (AVIATION WEEK Feb. 18, p. 60).

SNCASO (Societe Nationale de Constructions Aeronautiques du Sud-Ouest) has also worked out calculations for a Curtiss C-46 Commando using two auxiliary turbines.

► **The Installation**—The turbojet fitted to the SNCASO DC-3 is a Turbomeca Palas of 310-lb. thrust (since boosted to 350 lb.) enclosed in a spindle-shaped cowling slung under the center section. The unit is 5 ft. 3 in. long, 15.9 in. in diameter and weighs approximately 210 lb. Installation ups the plane's empty weight by 245 lb.

Two center section ribs beneath the DC-3 have been beefed up to take the attachment of the Turbomeca jet, which is connected by three bolts to iron fittings. Three inspection panels in the lower center section permit installation of the engine controls and maintenance access. No special fuel tanks were installed—the Turbomeca uses the same fuel as the piston engines. There is an independent fuel system so that the pilot can feed the jet from any one of the DC-3's four tanks. It can be started either on the ground or in flight and takes only 20 sec. to achieve full thrust.

► **Performance**—During the series of 50 flights made by SNCASO in cooperation with the French Air Ministry's flight test center, using standard temperature and altitude conditions, the Palas unit boosted the DC-3's rate of climb on one engine during takeoff by about 70 fpm. SNCASO estimates that this performance was the equivalent of increasing the craft's gross weight by about 1,770 lb.

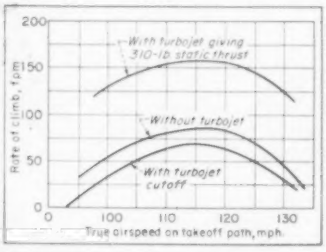
SNCASO expects to get a French certification of its modified DC-3 permitting operation at 29,000-lb. gross weight at takeoff (under Part 04 of CAB's Civil Air Regulations certain models of the DC-3 are certificated at gross takeoff weights of 25,200 lb. for passengers, 26,900 lb. for cargo operations).

Working out profits and costs, the company calculates a yearly revenue gain of $57,143 on the basis of carrying five extra passengers per flight, 750 takeoffs, 1,500-hr. utilization per year, block speed of 112 mph.

Added costs are estimated at $16,000 yearly, counting jet fuel, added fuel consumption by the piston engines because of the auxiliary unit's drag, maintenance, spares and amortization of the Palas over a three-year period.

SNCASO says it has over-estimated these costs, since it considered using a complete set of spares during a year's operation.

The price of a single Turbomeca Palas turbine is tentatively given as $16,857. The installation on a DC-3



AUXILIARY JET improves one-engine takeoff rate of climb by 70 fpm.

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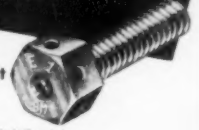

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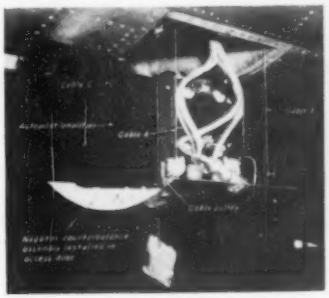
is said to be $19,714, with discounts on orders for ten or more units. Delivery is quoted within six months.

►**C-46 Installation**—Windtunnel trials made by SNCASO on a ⅛ scale model of a C-46 with two auxiliary Turbomeca Palas units indicate the plane could carry an additional 16 passengers or equivalent payload on the basis of an airplane gross weight of 46,000 lb., without sacrificing single engine performance safety minimums.

CAB certificates the C-46E and C-46F at 48,000-lb. gross takeoff weight for cargo operations, and recently revised allowable takeoff gross weight for passenger operations is 43,500 lb.



Counterbalance Eases Jet Maintenance

Lowering heavy and sensitive electronic equipment below an aircraft fuselage for maintenance is an exacting task. To provide a helping hand, Hunter Spring Co., Lansdale, Pa., has developed the Neg'ator, a torsion-spring counterbalance.

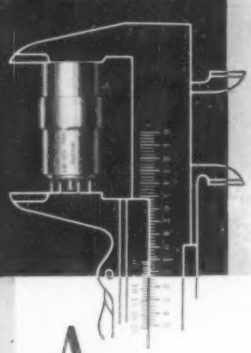
The device is currently in use on Republic's F-84G Thunderjet, where it is installed in the access door to the Lear autopilot gyro amplifier. It provides a 36-lb. counterbalance force over a distance of 18 in. Its volume is 8¼x5x2½ in.—just about the size of a current novel.

The amplifier assembly is lowered by three cables which are wound on a storage drum inside the device. Counterbalance force comes from a flat spring formed so that its relaxed shape is a tight coil; the spring is wound against its natural curvature onto an output bushing. Thus wound, the spring is highly stressed, and it tries to relieve its stress by returning to its relaxed shape.

This attempt at a stress-relief produces a torque which is transmitted through an output bushing to load the cables in tension.

The counterbalance may be locked for storage, with cables fully extended, by using a spring-operated plunger in the assembly.

subminiature pressure transducer



A pressure transducer weighing less than 1 ounce provides the accuracy and stability of the familiar unbonded strain gage, unaffected by reduction in size. The design allows flush mounting of the ⅝ inch diameter diaphragm. Natural frequencies, depending on range, extend to several kilocycles per second, yet the accuracy of ± 1% of full scale holds for static as well as dynamic measurements. The electrical output of the four active arm transducer bridge will operate oscillograph galvanometers directly.

The Model P81 Subminiature Pressure Transducer is described fully in Bulletin No. 3.4, available upon request.

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Republic Designs Avionics Into New Jet

- **Intercept missions will depend on electronics.**
- **But getting equipment in plane is a problem.**

By Philip Klass

How does a fighter manufacturer feel as he watches his airframe grow in size and weight to accommodate increasing numbers of black boxes of avionics equipment? What are his reactions as he sees the aerodynamically clean nose of his plane blunted to receive airborne radar?

A good place to observe the impact of avionics on the fighter-plane manufacturer is at Republic Aviation. Their early F-84s carried very little avionics equipment; their F-84Es carry more. But a new interceptor under design at Republic will be jampacked with more avionics equipment than any previous U. S. fighter and more than most World War II bombers.

▶**Mission's the Thing**—One might expect to hear the gnashing of teeth at Republic as they contemplate the prospect of avionics compromising their new interceptor design. But such is not the case.

To Republic, speed, rate of climb and ceiling in themselves are not end objectives of a fighter or interceptor. An interceptor, they feel, must be designed and equipped to perform its combat mission successfully. And they expect a new avionic intercept system to make their airframe a far more effective weapon than anything flying today. The system is under design by an undisclosed (for security reasons) avionics manufacturer.

▶**Airframes Only**—Unlike some airframe manufacturers, Republic is "sticking to its last," and not planning to develop, design, or produce avionics equipment.

In some other instances, like optical tooling, Republic has developed equipment or processes where the need, but no supplier, existed. But when the development was completed, Republic has turned it over to others to manufacture in order to concentrate on designing and building airframes. This past policy has shaped present thinking not to enter the avionics manufacturing field.

But if Republic doesn't want to develop or produce avionics equipment, it does want to get into the act to be sure that the avionics and airframe can be happily mated. That in itself represents a radical departure from World War II practices.

REPUBLIC F-84E typifies growing avionic complexity of new jet fighters.

▶**F-47 Avionics**—The major avionics item on the Republic F-47 was its two-way communications equipment. The airframe and avionics manufacturers were comparative strangers. Republic was told only what size mounting racks and how much electrical power to provide for "black boxes" furnished by the Air Force. In some cases, the avionics equipment wasn't installed until after the plane had left Republic.

▶**Today's Picture**—Today all that is changed. Republic and the avionics manufacturer's engineers meet on an average of every three weeks to work out avionics/airframe problems connected with the projected interceptor. This is significant because production of the plane is still sometime off. As the program nears production, this liaison tempo will increase.

Why is such close integration required at this early stage?

The radome for the radar will provide one answer: For optimum radar transmission, avionic engineers might like a blunt hemispheric-shaped radome in the plane's nose. But this would raise hob with the aerodynamics of the airplane. The pointed nose which a Republic aerodynamicist might want would give the radar a bad case of astigmatism.

Obviously good radar vision and airplane speed are both essential, so it's a matter of compromise. This in turn requires mutual education of both organizations so they will understand each other's problems. That is where Republic's electronic development group under C. E. White enters the picture.

White and his small staff are electronics engineers living in an aerodynamic atmosphere. As a result, they can interpret aerodynamic problems in

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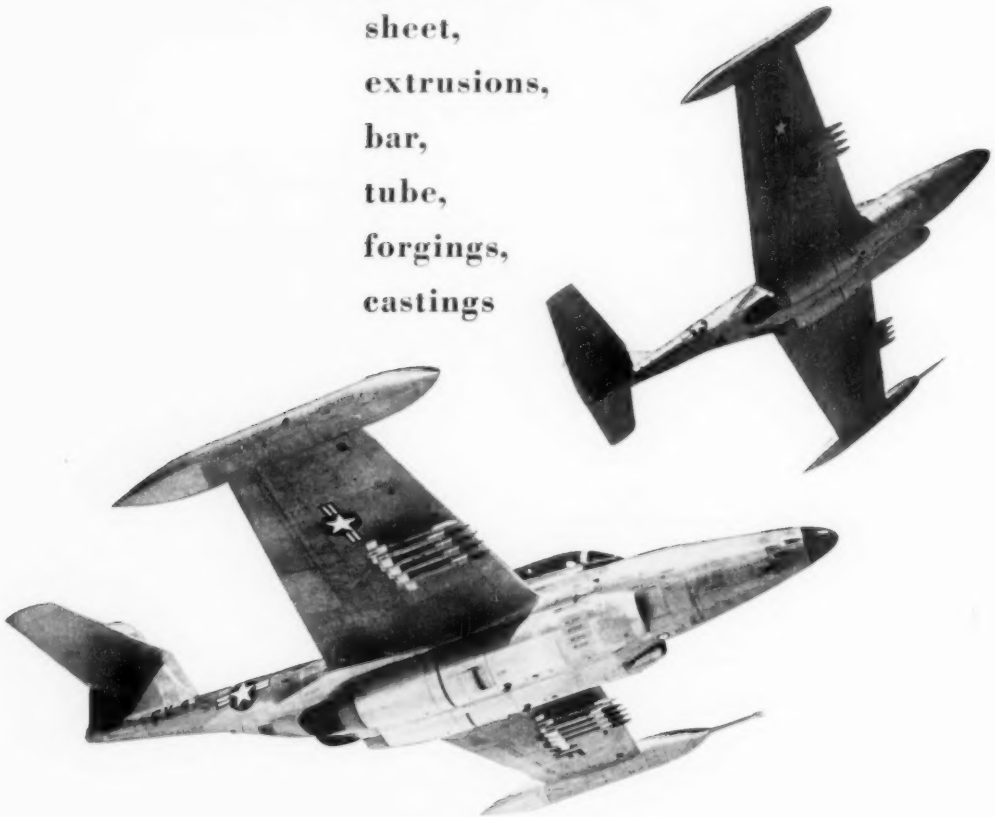

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terms which the avionics manufacturer's engineers will understand. Similarly, they can explain avionic problems to Republic's aeronautical engineers.

▶ **No Square Pegs**—Until recently, airframe manufacturers took avionics equipment in whatever size and shape an avionics manufacturer provided. But not any more. Space has become critical in jet fighter aircraft because there's so much more avionic equipment and it must compete for space with fuel cells required for thirsty engines.

No longer can avionics equipment be a square peg in a round hole. Rectangular shapes for avionics equipment wastes valuable space in curved portions of the fuselage. The logical step is to shape avionics equipment to the airframe contours—and that is just what is being done.

▶ **Dual Benefits**—Acquainting the avionics engineer with airframe problems encourages him to cock an eye to space and weight saving of the equipment when installed. For example, the space required to mount an avionics device with vibration mounts may be 25% more than the size of the device itself in order to provide "sway space" and prevent adjacent devices from hitting one another.

If the entire unit is vibration-mounted only because of several small "delicate" components within the unit, why not provide these components with their own internal vibration mount? The resulting elimination of external vibration mounts can save considerable airframe space, according to White.

Similarly, by understanding what environmental or installation conditions hurt the performance of avionics gear, the airframe designer can see to it that avionic equipment locations are carefully, not haphazardly chosen.

▶ **Avionics Growth**—The rapid growth of avionics equipment aboard fighters in terms of size, weight, and power requirements is pointed up by a study-analysis which Republic's White made several years ago. This pre-dated Republic's present interceptor design contract.

White's analysis included an F-84D, an F-84E, and a hypothetical plane equipped to fight and operate in all-weather conditions. The latter is comparable to the plane on which Republic is currently working.

White's study showed that an F-84E carried 1/3 more avionic weight than the F-84D, and that the hypothetical all-weather plane would carry 3½ times more avionic weight than the F-84D. Space required for avionics equipment showed even slightly more growth.

But it was in the electrical power consumption of avionics equipment that growth was most phenomenal. The F-84E avionics power consumption was almost three times that of the F-84D, while the hypothetical all-weather plane, it was estimated, would use more that 7 times the power of the F-84D.

▶ **Cloudy Crystal Ball**—Admitting that he had underestimated the amount of avionics equipment required for tomorrow's all-weather interceptor, White said his figures were "about 50% low." (This figure was a generalization because of security considerations.)

A functional listing of some of the major avionics items in the interceptor shows why weight, size, and power requirements have climbed skyward. Many of them have never before been used in fighter-type aircraft.

- **Intercept radar.**
- **Intercept computer.**
- **Automatic pilot.**
- **UHF communications equipment.**
- **IFF (identification, friend or foe).**
- **ADF (automatic direction finder).**
- **VOR navigation receiver.**
- **ILS glide-slope receiver.**
- **Radio altimeter.**
- **Automatic engine controls.**

▶ **Another Yardstick**—Another indication of the effect of avionics on fighter-type aircraft is the requirement for tighter control of a.c. power supply frequency and voltage. For example, the allowable frequency variation of ±10% on the old F-47 had to be cut to ±5% on the F-84E. The new Republic

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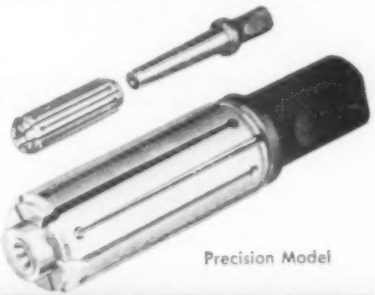

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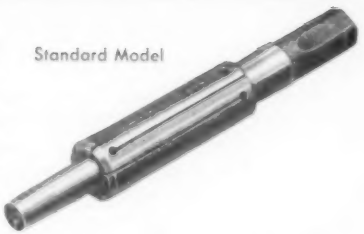

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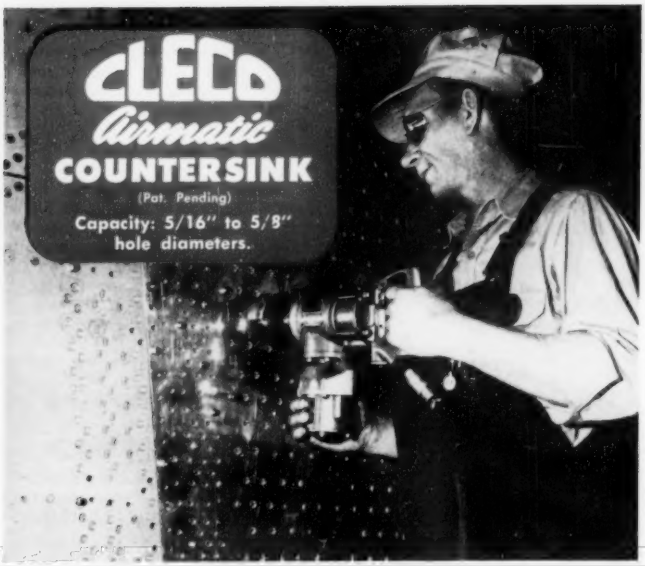

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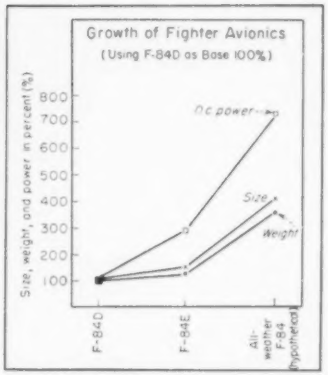


STEADY RISE in avionics requirements is seen in this comparison of the F-84D, -E, and proposed all-weather model.

plane must provide a.c. power with frequency variation of no more than ±0.1%, or 100 times as close as in the F-47. A.c. voltage regulation is also being tightened.

▶ **Technical Manpower**—From practically no avionics engineers in the World War II, Republic has assembled a small group of engineers who work full or part time on White's staff. Probably this group will grow as the program moves along, but Republic doesn't expect it to mushroom.

Nor at this stage can Republic estimate the increased number of avionics technicians it will need to install, test, or service the new plane's avionics equipment. Possibly the avionics manufacturer will station his own technicians at Republic to assist in installation and check-out.

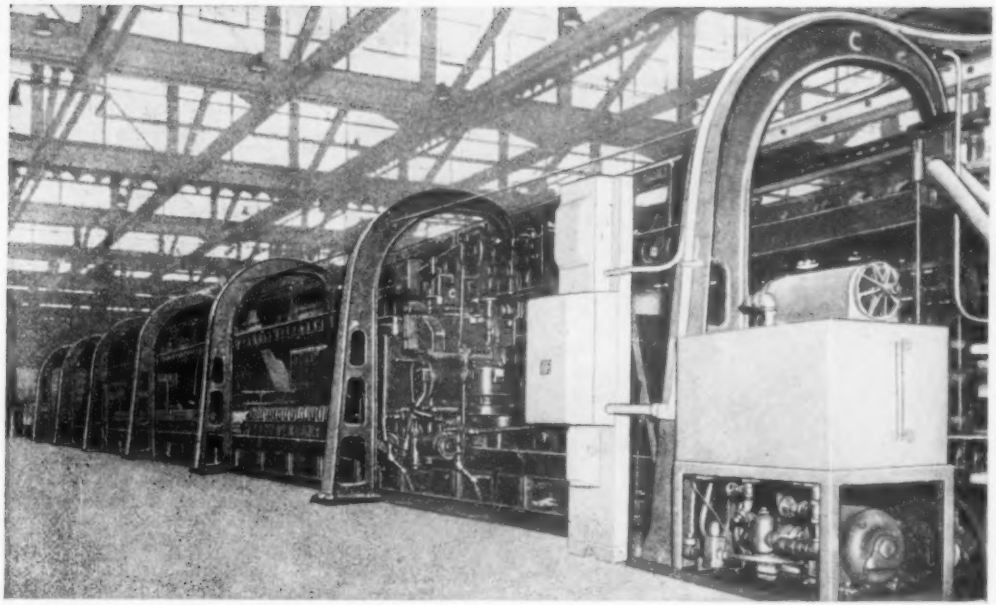
▶ **Confident**—Recognizing that they haven't yet felt the full impact of avionics, Republic officials nevertheless appear confident that there are no serious avionics/airframe problems which close liaison and a little give-and-take cannot fix.

All-Weather Switch

A group of all-weather plunger switches, proofed against immersion and with plunger arms tough enough to break any ice that forms, are being offered to the industry by Unimax Switch division of W. L. Maxson Corp.

The switches are designed for landing gear, flap and other aircraft applications. The assembly in the photo above is a standard AN-3210-1 or AN-3216-1 precision switch mounted in an aluminum housing sealed against moisture. A plastic cover protects terminals against accidental shorting or grounding. Either single-break or double-break contact arrangements can be handled.

Unimax Switch division, W. L. Maxson Corp., 460 W. 34 St., New York 1.



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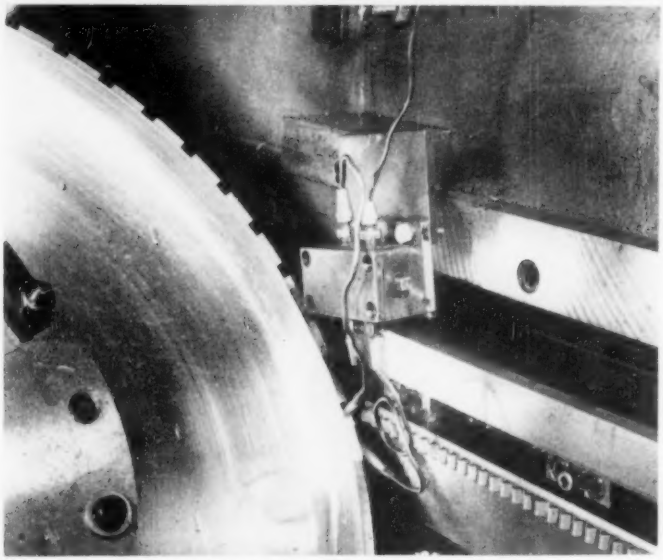


TITANIUM ALLOY forged discs are broached using CO_2 jets as coolant.

What We Know About Titanium

Place in aviation seems assured for this strong, light, hard metal as working techniques are improved.

By P. G. DeHuff
and W. S. Hazelton*

Titanium, a comparative newcomer among metals, is carving a place for itself in the aviation field.

It has been used in experimental jet engines and plans are being made for its application in the newest models of production jets. Titanium has unusually advantageous properties, but it is only the great amount of research and development completed on its technology in the last three years that make possible its choice today.

▶ **High Strength, Weight**—Primary reason for the interest of the designer of aircraft and aircraft powerplants in titanium and its alloys is the substantial weight saved when it is used in place of steel and aluminum. It is obvious that titanium alloys weighing three-fifths as much as steel and having the same strength reduce the weight of engine parts. It can also be seen in the accompanying graph why weight savings can be made, in many cases, by the substitution of titanium for aluminum and magnesium alloys, especially at temperatures above 300F.

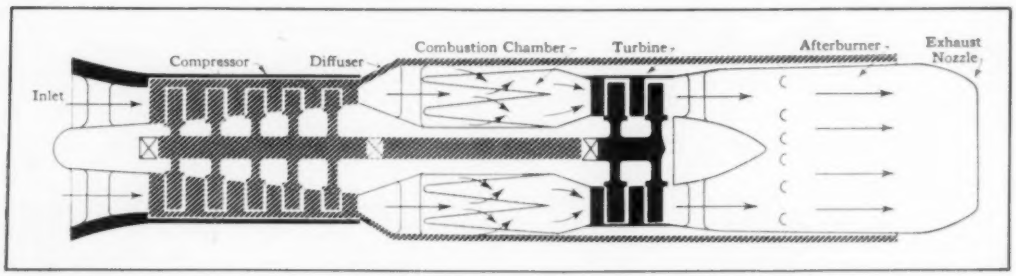
Commercially pure titanium starts to lose some of its advantage over stainless steel around 200F, but titanium alloys still hold a significant advantage up to at least 800F. Above 700F, however, the creep strength of titanium alloys available today starts to decrease, and in some applications limits their use.

Titanium also has advantages in addition to its strength-weight ratio for jet engine parts. It is very resistant to the corrosive gases encountered in a jet engine. It is more resistant to salt air and water than 18-8 stainless steel, which is considered to be good in this respect. In fact, titanium is comparable to platinum in resistance to corrosion by salt air and water. Because many Westinghouse jet engines are used in carrier-based Navy aircraft, this corrosion resistance is of great importance.

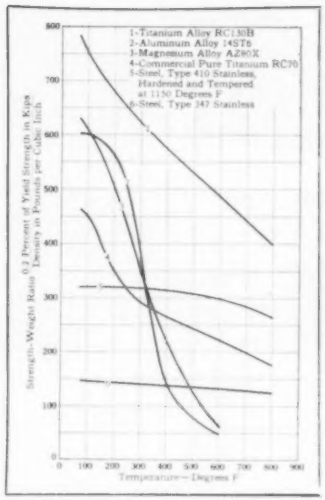
Also, titanium ores are plentiful in this country and would be readily available in an emergency. Use of titanium, furthermore, would save significant amounts of critical materials, such as chromium and nickel.

▶ **Problems Involved**—Each component for which a titanium alloy is eligible presents problems basic to the use of any new metal and poses difficulties to manufacturing on a production scale. One of the greatest drawbacks to use of titanium and titanium alloys has been the almost complete lack of fundamental knowledge of the metallurgy of titanium. The art is so young that, literally, there has not yet been time enough to develop the metallurgy fully. Little has been known of the structures of titanium and its alloys—how the variables in chemical composition, processing, and heat treatment affect the

* Metallurgical Engineering Section, Aviation Gas Turbine division, Westinghouse Electric Corp.



PLACE FOR TITANIUM is indicated in this jet engine cutaway. The cross-hatched section shows where the metal has been used or has been investigated—in compressor discs, compressor blades, compressor stators, bolts, compressor and turbine liners, and sheet metal parts. New alloys are expected to increase titanium's heat advantage over steel.


1-Titanium Alloy RC130B
2-Aluminum Alloy 14ST6
3-Magnesium Alloy AZ61X
4-Commercial Pure Titanium RC70
5-Steel, Type 410 Stainless, Hardened and Tempered at 1150 Degrees F
6-Steel, Type 347 Stainless
Strength-Weight Ratio = 0.2 Percent of Yield Strength in Kips / Density in Pounds per Cubic Inch
Temperature—Degrees F

TITANIUM alloy exceeds other common materials in strength-weight ratio.

structures and the properties. Strides have been made in the past year toward an understanding of these all-important factors, but much research must yet be done before the understanding of titanium compares with that of steel, aluminum, and other alloys.

► **Forging, Joining**:—Forging was one of the first processes studied. This procedure presented serious difficulties, but these have been effectively solved.

The ease with which sound-appearing welds can be made with titanium led to the early belief that there would be no joining problems. But this view quickly vanished. Although strong welds can be made with commercially pure titanium by the Heliarc and resistance-welding process, great care must be taken to prevent absorption of gases, which produces brittleness. Even with optimum practices, welds in commercially pure titanium are much less ductile than the parent metal. However, we have succeeded in developing techniques for making simple welds on commercially pure sheet. More complicated joints are being investigated.

Welding of alloyed titanium is a more difficult matter. The main problem, aside from the embrittling effects of gas contamination, is the quench-hardening of this sheet during cooling from the welding temperature. Heat treatments designed to soften the hardened structure do not result in the same ductile microstructure produced by hot working.

Flash butt welding permits hot working of the material and has been applied to large rings for Westinghouse jet engines. Work is being done on the flash butt welding of sheet with promising results. We now have a technique for

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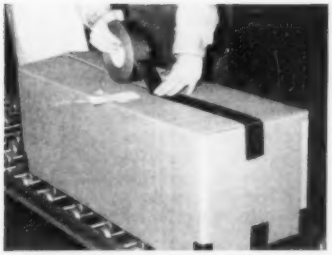
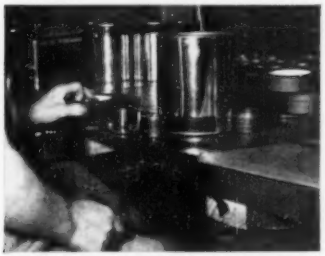
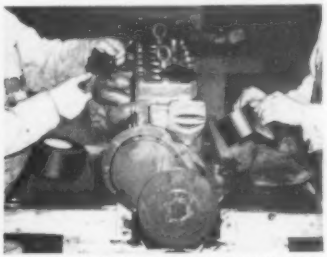


STEWART-WARNER PACKS SOUTHWIND HEATERS for the Army. They use an inner and outer carton and an aluminum foil-lined bag, formerly used two tapes, now seal both cartons with Polyken No. 215.

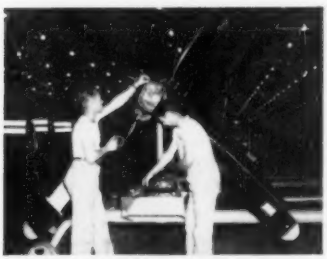
SHIPPING SHOWER BATHS FOR THE ARMY. August G. Barkow Co., Milwaukee, specializes in packing for Gov't Spec and export, uses Polyken No. 214 to seal mobile shower units made by Cleaver-Brooks Co.



BENDIX "CANS" SPARE PLANE PARTS for Navy and Air Force, seals with Polyken waterproof tape. Mechanics in field remove desired parts, reseal cans with same tape.



HOW STUDEBAKER SEALS ENGINES FOR EXPORT. Waterproof Polyken No. 214 seals engine block openings to prevent collection of dust, formation of rust.



MOISTURE IMPERMEABLE paper is held on propellers with strong, tough, waterproof Polyken No. 261.

TIGHT SEAL OF A WIDE GAP on telescopic-type shipping carton is fast, easy and secure with one 2" strip of Polyken Tape No. 261.

This outstanding line of Gov't Spec tapes now presents No. 329, a new tape that is virtually 100% WATERPROOF

If you sell the Government any product packaged with pressure-sensitive tape, you know the tape must meet specification JAN-P-127.

These rigid requirements are met with the complete line of Polyken cloth-back tapes, which now includes the new Polyken No. 329, a tape that is virtually 100 per cent waterproof. This newly-developed Type I Grade A tape is the latest and most outstanding in the Polyken line, and is *an almost perfect moisture vapor barrier.*

Even if you are not immediately concerned with meeting Gov't Specs, this amazing new tape—together with the complete line of Polyken tapes—can help solve your packing, packaging and production problems. Send in coupon for free booklet, specifications and a sample of new Polyken No. 329.

Polyken Tapes meeting Gov't Spec JAN-P-127

Type I Grade A—Tape Nos. 320 (black), 328 (red), 329 (olive drab).*

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*Also available in all other specification colors.

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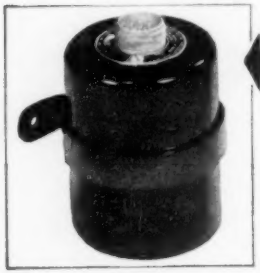

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hot rolling Heliarc and resistance seam welds that improves the ductility of titanium-alloy welds.

Silver-alloy brazing as an alternate method of joining also has its problems. The very thin and adherent oxide that gives titanium its corrosion resistance also offers the same resistance to fluxes. Several different fluxes and alloys have been investigated. Fluoride fluxes and high-temperature brazing alloys can be used, but the resulting joint is brittle. Although some progress has been made, no completely satisfactory techniques have been devised.

Partly because of these joining problems, and partly because of design considerations, it was felt from the early stages of titanium development that the most promising application of titanium in jet engines was for forged compressor disks.

► **Machining**—One of the basic difficulties encountered in getting titanium into production was the development of machining and grinding techniques. Titanium alloys particularly are difficult to machine. Tool wear is very rapid. Although these alloys are not excessively hard (about 293-321 BHN), the abrasive particles of titanium carbide found in some alloys quickly cause tool breakdown.

Another reason for tool wear is the smearing tendency common to all titanium alloys. This causes buildup and friction-grinding of the tool edge. When the tool is dulled by these two factors, the machined surface is work hardened and the machining problem is intensified.

Although machining and grinding problems have been tough ones to solve, we now have tools and techniques by which titanium alloys are machined in production at costs comparable to those of stainless steels.

► **Tool Life**—Tool life when machining titanium alloys is, as in other materials, dependent on cutting speed. The abrasiveness of titanium alloys can be reduced by new methods of melting that keep the carbon content to a minimum, thereby eliminating most, if not all, of the very hard titanium carbides in the structure.

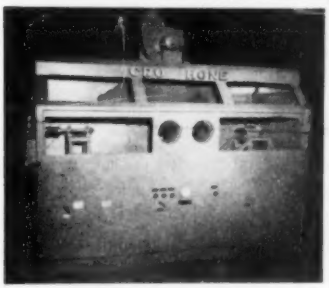
Early melting practice utilized a graphite crucible heated by induction. Although this technique permitted carbon pick-up from the crucible, the contamination resulting from the use of other refractory materials was much more detrimental. With the successful development of the arc-melting process, using a water-cooled copper crucible and a graphite electrode, carbon contamination can be held easily to a maximum of 0.25% as compared to up to 1% in the induction-melted product. Use of a tungsten electrode permits melts to be made with only a trace (0.05% maximum) of carbon, but with some tung-

sten pickup, which is undesirable when it is in the structure as hard particles or stringers. New methods have recently been announced whereby even less contamination is claimed.

► **Carbide Tools**—The abrasive action of titanium can be reduced by the use of super-hard grades of carbide tools for lathe and boring-mill operations. These materials also seem to resist tool breakdown caused by the smearing action of titanium. The great superiority of carbide-tool materials has led us to investigate broach designs that utilize carbide inserts. The broaching of blade root grooves in titanium alloy discs to very close tolerances is impossible with high-speed steel broaches because of rapid tooth wear. With proper tooth loads and design the carbide-tipped broach has proven very satisfactory.

► **CO$_2$ Coolant**—Another new wrinkle has been developed for the machining of titanium. This is the use of carbon dioxide as a coolant in place of oils or emulsions. Jets about 0.010 in. in diameter shoot streams of gas directly at the tool-work interface. This gives much better cooling than is possible by the usual methods. The improved cooling action helps prevent tool breakdown not only by preventing overheating of the tool edge, but also by reducing the smearing tendency of the titanium.

Carbon dioxide has another great advantage in the machining of titanium. Because the metal is so expensive, it is imperative that all possible scrap be saved and reclaimed. The amount of scrap in the form of turnings produced in the manufacture of a compressor disk

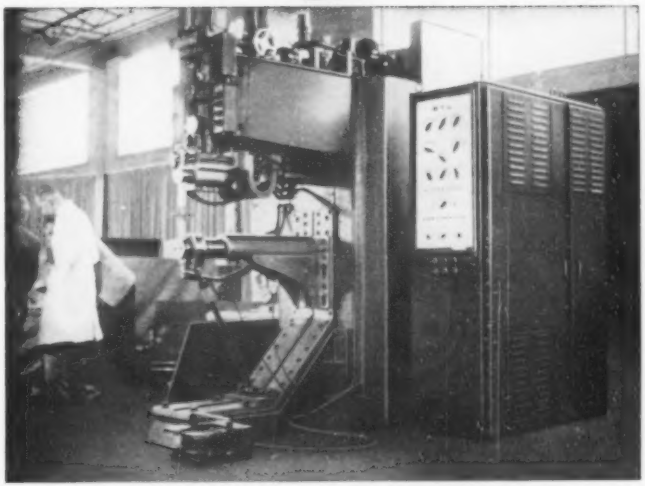


WET-BLAST CLEANER

Only one operator is needed to handle three stages in wet-blast-cleaning the 5-ft. turbine wheel and shaft assembly for the Allison J35 jet when this compact unit, built by Cro-Plate Co., Hartford, Conn., is used. The machine measures 8x4x7 ft., has a track-mounted dolly for loading the work into the cabinet. The assembly is rotated up to 28 rpm. on centers by a variable-speed Graham transmission. There is a built-in blower for exhausting blasting vapors. Air requirements for operation are 80 cfm. at 90 psi.

CONTINUOUS or SPOT WELDING of ALUMINUM

WELTRONIC 3-PHASE FREQUENCY CONVERTER



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The Weltronic frequency changer control operates in conjunction with a 3-phase welding transformer distributing the load over the three phases of the power supply. The lower reactive effect results in an extremely high power factor and a low KVA demand.

Frequency converter control minimizes overloaded distribution lines.

The three phase frequency converter type control provides a low rate of current rise which reduces spitting and tip pickup, this providing improved weldability.

Reactance is controlled by a selector switch which in turn assists in the control of welding current. The reactive effect of the machine is reduced approximately in proportion to the reduction in frequency, providing the distinct advantage of being resistance sensitive.

Weltronic three phase frequency converter controls are available for all types of seam and spot welding operations.

Weltronic converters are in operation in a number of major aircraft plants.

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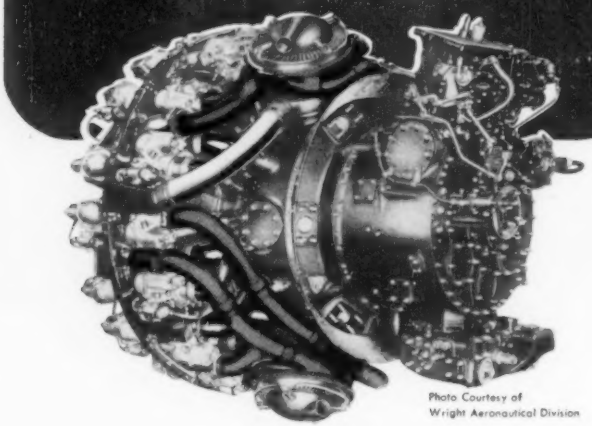

Photo Courtesy of
Wright Aeronautical Division

The old saying "A chain is no stronger than its weakest link" might easily be the axiom of aircraft design. No unit of the compound reciprocating engine is more significant for its efficient service than the lowly exhaust pipe.

Smith-Morris is proud of its contribution to the success of the Wright Turbo-Cyclone "18". In the field of high temperature sheet metal fabrication Smith-Morris quality assures dependable and trouble-free service. Our experience may offer a solution to your fabrication problem.

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AIRCRAFT EXHAUST MANIFOLD SYSTEMS
GAS TURBINE PARTS AND ASSEMBLIES

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weighs more than the finished part.

In order to be remelted, this scrap must be almost chemically clean, or the impurities will cause brittleness in the remelted material. Even the films and oxides left on turnings produced with a water-soluble cutting fluid cannot be sufficiently removed to permit this scrap to be remelted satisfactorily.

But chips produced during machining with carbon dioxide as a coolant are clean and excellent for remelting.

► **Grinding**—Another operation involved in the manufacture of titanium-alloy compressor disks threatened to cause trouble on a production basis. This was an automatic grinding operation that had to hold dimensions to extremely close tolerances (within 0.0002 in.). The titanium wore the grinding wheels so fast that automatic operation was impossible. Main reason for this rapid wheel-wear was probably associated with the smearing tendency of titanium, because wheels hard enough to hold their shape glazed over quickly. But a systematic study of wheel abrasives, bonds and grit size, coolants and wheel speeds has resulted in suitable techniques.

The result of all this effort means that a completely new material is available for the designers of Westinghouse jets. There are many problems yet to be solved, but we are firmly convinced that titanium has a large place among our structural metals.

USAF Offers Surplus Tools

Midcentral Air Procurement District, Chicago, has sent invitations out to approximately 1,000 firms inviting them to bid on 40 machine tools that have been rejected by various government agencies.

The selection includes gear grinders, boring machines, chip breakers, lathes, screw machines, profilers, milling machines and threaders. Interested parties may inspect the machines at Government Plant No. 1, Offutt AFB, Omaha, during June 2-6.

Arrangements to visit the site can be made through Philip C. Hughes, Tumpane Co., Offutt AFB. Bids will be opened publicly in Chicago on June 16 and the winners can pick up their selections within 40-60 days.

Missile Group Expands

Union Steel Co. is expanding its recently formed Aircraft and Guided Missile division, E. Los Angeles, by 220,000 sq. ft., bringing its total to 500,000 sq. ft. Firm specializes in high precision jigs, and fixture tooling for wing, tail, fuselage and other aircraft sections, including design, fabrication and final assembly in customer's plant.

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The Missile and Control Equipment Laboratory of North American Aviation has openings in its flight test organization to handle flight testing of guided missiles and electronic control systems.

Excellent opportunities are offered for experienced engineers and analysts with airplane and guided missile flight test and flight test instrumentation background.

Outstanding opportunities are available on a long-range development program on basic guided missile work.

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Missile and Control Equipment Laboratory

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DOWNEY, CALIFORNIA

DOWNSVIEW plant and field (background) which de Havilland is giving up to RCAF.

De Havilland-Canada to Move Plant

De Havilland Aircraft of Canada Ltd. is busy making plans to quit its plant at Downsview near Toronto after a 23-year stay. The oldest and third largest Canadian aircraft builder has to vacate its premises by mid-1954 because the RCAF plans to expand its present auxiliary base there into a top supply, maintenance and research center.

The government paid DHC $5 million for its 126-acre site, including $3.6 million for capital assistance in setting up a new plant.

RCAF will spend approximately $8 million in building up supply, overhaul and maintenance facilities, with over $2 million going into an aerophysics laboratory, including animal colony. A new 8,000-ft. north-south runway will be installed to replace the field's present northeast-southwest strip. Two RCAF auxiliary squadrons will remain at the base.

Although DHC has a number of production irons in the fire, the enforced move may work out to its advantage. A modern plant will be put up incorporating the latest ideas for most efficient production. Present facilities have been built up gradually since 1929.

The firm has been experiencing some tax problems with the local community, which has increased its assessment some 400% in the past few years. Although DHC has been offered 95 acres at the southwest portion of the RCAF property, other communities, interested in getting a new industry with a payroll of about 2,200, are putting in their bids. This should give the firm a good bargaining advantage in its relocation plans.

The company is turning out approximately five Beaver light transports a month for Canadian and export markets, plus the L-20 version for the USAF, which has ordered about 115. Soon DHC will start building the larger Otter, seating 14 passengers, and expects to get this plane out at the rate of one a week in 1953.

It also does considerable overhaul work: Lancasters and Cansos (PBYs) for the RCAF, and Vampire fighters and their Goblin turbojet engines for auxiliary RCAF squadrons.

Certificates Of Necessity

Accelerated tax amortization for manufacturers expanding their defense facilities is granted by the government in the forms of certificates of necessity.

In the following list of recent certificates, company name is given, followed by product of service, cost of construction deemed necessary for defense expansion but of no likely civilian use after the emergency, and the percentage of the expansion cost allowed for fast tax write-off. Fast write-off permits property to be depreciated in five years.

- **Arc Equipment Corp.**, Byran, Ohio, oxygen regulators, $305,076, 70%.
- **Hill Manufacturing Co.**, Detroit, aircraft parts, $152,668, 70%.
- **Master Electric Co.**, Dayton, aircraft parts, $222,154, 50%.
- **Chicago Forging and Mfg. Co.**, Chicago, aircraft parts, $61,114, 80%.
- **Perfex Corp.**, Milwaukee, aircraft parts, $2,862, 65%.
- **Sprinkle Machine Co.**, Galveston, Ind., aircraft engine parts, $16,320, 80%.
- **John Oster Mfg. Co.**, Racine, Wis., aircraft motors, $25,548, 80%.
- **Metal Spinners, Inc.**, Milwaukee, aircraft parts, $58,500, 70%.
- **South Bend Bait Co.**, South Bend, Ind., aircraft parts, $7,052, 65%.
- **Chicago Rivet & Machine Co.**, Bellwood, Ill., parts for aircraft and ordnance, $32,-947, 50%.
- **Engineering Metal Products Corp.**, Indianapolis, aircraft parts, $179,000, 50%.
- **Beaver Gear Works, Inc.**, Rockford, Ill., aircraft parts, $2,365, 80%.
- **Morton Mfg. Co.**, Libertyville, Ill., airplane landing steel mat, $145,428, 65%.
- **Bowser, Inc.**, Ft. Wayne, Ind., aircraft parts, $162,644, 65%.
- **H. M. Harper Co.**, Morton Grove, Ill., parts for AF and Navy, $256,867, 50%.
- **Foote Bros. Gear and Machine Corp.**, Chicago, aircraft parts, $195,000, 30%.

ENGINEERS—
LOOK TO THE FUTURE
WITH
NORTH AMERICAN

The engineering department that consistently produces the "best" at the right time—B-25, F-51, T-6, now the F-86 *Sabre* jet series, AJ-1, FJ-1, FJ-2, T-28, B-45—offers engineers a real opportunity to become a part of the advance idea teams that are designing today for tomorrow and the future of aviation. Become a part of the outstanding aircraft engineering group in the aircraft industry by writing for complete information on career opportunities at North American. Please include a summary of your education, background and experience.

North American Extras—

Salaries commensurate with ability and experience • Paid vacations • A growing organization • Complete employee service program • Cost of living bonuses • Six paid holidays a year • Finest facilities and equipment • Excellent opportunities for advancement • Group insurance plan • Sick leave time off • Generous travel allowances • Employees Credit Union • Educational refund program • Low-cost group health, accident and life insurance • A company 24 years young.

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North American Has Built More Airplanes Than Any Other Company In The World

Engineering Personnel Office
Los Angeles International Airport

- **General Motors Corp.**, Indianapolis, aircraft and ordnance parts, $594,200, 65%.
- **Alloy Products Co.**, Marion, Ind., aircraft parts, $117,200, 70%.
- **Scott-Atwater Mfg. Co., Inc.**, Minneapolis, aircraft parts, $36,586, 80%.
- **Grayco Industries, Inc.**, El Dorado, Kan., aircraft parts, $69,374, 70%.
- **Smallwood and Son Machine Co.**, Dallas, Tex., aircraft parts, $16,275, 50%.
- **United Aircraft Corp.**, Dallas, aircraft parts, $422,876, 65%.
- **Raytheon Mfg. Co.**, Oxnard, Calif., aircraft parts, $10,871, 65%.
- **Raytheon Mfg. Co.**, Point Mugu, Calif., aircraft parts, $3,596, 65%.
- **Lockheed Aircraft Corp.**, Burbank, Calif., aircraft spare parts, $944,885, 65%.
- **H. W. Loud Machine Work, Inc.**, Pomona, Calif., aircraft hydraulic systems, $20,805, 50%.
- **The Aircraftsmen Co.**, Gardena, Calif., aircraft components, $80,000, 65%.
- **Precision Sheet Metal Inc.**, Culver City, Calif., aircraft assemblies, $407,592, 65%.
- **Mor-Gen Industries**, Gardena, Calif., precision grinding aircraft bolts, $18,377, 50%.
- **Cell Form Co.**, Los Angeles, aircraft parts, $103,250, 50%.
- **Reynolds Industries, Inc.**, Santa Monica, components for aircraft, $219,105, 80%.
- **Allied Tool Products**, No. Hollywood, Calif., aircraft components, $26,257, 80%.
- **Wemac Co.**, Inglewood, Calif., aircraft parts, $3,122, 80%.
- **Aerolab Development Co.**, Pasadena, Calif., equipment for aircraft research, $31,200, 80%.
- **Dooling Brothers**, Los Angeles, aircraft parts, $4,181, 80%.
- **Saxco Mfg. Co.**, Los Angeles, aircraft parts, $22,987, 80%.
- **Electric Switch and Controls, Inc.**, Culver City, Calif., relays for aircraft, $75,000, 65%.
- **Experimental Specialties Co.**, El Segundo, Calif., aircraft parts, $28,898, 50%.
- **California Rubber Products, Inc.**, Hawthorne, Calif., aircraft parts, $41,500, 50%.
- **Affiliated Gas Equipment**, Montevia, Calif., aircraft parts, $329,390, 65%.
- **Stone Mfg. Co.**, Inglewood, Calif., aircraft parts, $89,899, 70%.
- **William R. Whittaker Co., Ltd.**, Los Angeles, aircraft parts, $347,351, 65%.
- **William R. Whittaker Co., Ltd.**, Los Angeles, valves for military aircraft, $52,895, 65%.
- **Aluminum Taper Milling Co.**, Culver City, Calif., aircraft parts, $86,014, 80%.
- **Goodyear Aircraft Corp.**, Litchfield Park, Ariz., aircraft parts, $447,574, 65%.
- **Steelton Tool-Die and Machine Co.**, Costa Mesa, Calif., aircraft parts, $34,295, 50%.
- **California Reinforced Plastics Co.**, Berkeley, Calif., aircraft improvements, $146,600, 70%.
- **Bendix Aviation Corp.** North Hollywood, Calif., aircraft parts, $62,521, 65%.
- **Leeroy Machine Co.**, Burbank, Calif., aircraft parts, $3,095, 80%.
- **MacClatchie Mfg. Co.**, Compton, Calif., aircraft parts, $22,426, 80%.
- **The Ryan Aeronautical Co.**, San Diego, Calif., aircraft parts, $25,241, 65%.
- **Modglin Co., Inc.**, Los Angeles, aircraft parts, $589,961, 65%.
- **Boeing Airplane Co.**, Seattle, production of airplanes and spares, $475,396, 65%.
- **Ring Screw Works**, Macomb County, Mich., aircraft parts, $97,868, 50%; $850,000, 30%.
- **National Gypsum Co.**, Niles, Mich, aircraft parts, $170,000, 65%.
- **Aluminum Industries, Inc.**, Cincinnati, aluminum castings for aircraft, $172,741, 65%.
- **Crawford Door Co.**, Detroit, aircraft parts, $173,002, 65%.
- **Aeroquip Corp.** Jackson, Mich., aircraft parts, $22,069, 65%.
- **The Parker Appliance Co.**, Cleveland, aircraft parts, $83,103, 70%.
- **Chicago Screw Co.**, Bellwood, Ill., aircraft parts, $371,466, 65%.
- **Borg-Warner Corp.**, Chicago, aircraft parts, $211,595, 65%.
- **J. J. Tourek Mfg. Co.**, Chicago, aircraft and ordnance parts, $47,700, 75%.
- **Guardian Electric Mfg. Co.**, Woodstock, Ill., aircraft parts, $2,511,780, 65%.

Dependable

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HERMETICALLY-SEALED LIMIT SWITCH

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Hot or cold . . . dry or humid . . . in the air or on the ground the new ELECTRO-SNAP Hermetically-Sealed Limit Switch will function perfectly. That's because it has its own atmosphere (an inert gas) sealed in . . . to make its operation absolutely impervious to dust, temperature or moisture conditions—and no tampering or misadjustment is possible.

The "Teflon" cover on the diaphragm prevents any possibility of jamming by ice adhesion. And because of its tipping motion—no external sliding parts—it will free itself of ice accumulation and allow reset without help.

Write for free sample Basic Switch and data sheet on Electro-Snap Hermetically-Sealed Limit Switch H-203G.

ELECTRO-SNAP PRODUCTS

AF Approved:
Electrical Components Listed by Underwriters Laboratories

- Splash-proof aircraft switches
- Industrial limit switches
- Momentary-pulsing limit switches
- Push-button and lever-type actuators

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*The Sikorsky H-19 Helicopter

Sikorsky, an illustrious name in aviation, gains added lustre as reports of unprecedented rescue operations come to us from the Korean battlefront. Electrol, by aiding in the development of hydraulic installations of specialized design, contributes in some measure to the great service these "flying windmills" perform in the saving of precious human lives.

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CYLINDERS • SELECTOR VALVES • FOLLOW-UP VALVES
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VALVES • ON-OFF VALVES • SERVO CYLINDERS • TRANSFER
VALVES • CUT-OUT VALVES • SPEED CONTROL VALVES

- **Hart Pressed Steel Corp.**, Elkhart, Ind., aircraft parts, $35,700, 65%.
- **Perfex Corp.**, Milwaukee, aircraft parts, $36,846, 70%.
- **Foote Bros. Gear and Machine Corp.**, Chicago, aircraft parts, $21,416, 70%; $53,631, 70%.
- **Inland Steel Products Co.**, Milwaukee, aircraft parts, $1,647,300, 50%.
- **Coleman Co., Inc.**, Wichita, aircraft parts, $155,000, 65%.
- **Intercontinental Mfg. Co., Inc.**, Garland, Tex., aircraft components, $570,600, 65%.
- **Robert L. Welch**, Lakewood, Ohio, aircraft products, $2,665, 65%.
- **Toledo Metal Spinning and Mfg. Co.**, Toledo, aircraft parts, $32,530, 65%.
- **Allan Edwards, Inc.**, Tulsa, aircraft parts, $33,507, 70%.
- **Wichita Engineering Co.**, Wichita Falls, Tex., aircraft & ordnance parts, $20,207, 75%.
- **Phaostron Co.**, So. Pasadena, Calif., aircraft parts, $20,360, 75%.
- **Solar Aircraft Co.**, San Diego, Calif., aircraft parts and components, $215,003, 65%.
- **Nichols Machine Co.**, Los Angeles, aircraft parts, $28,480, 70%.
- **Magna Mill Products Co.**, South Gate, Calif., aircraft parts, $302,294, 75%.
- **Cahlair Products Co.**, Culver City, Calif., aircraft parts, $11,384, 75%.
- **Goodyear Aircraft Corp.**, Litchfield Park, Ariz., aircraft parts, $109,581, 65%.
- **Schultz Steel Co.**, South Gate, Calif., aircraft alloy, steel bars, billets and forgings, $28,827, 50%.
- **Western Gear Works**, Lynwood, Calif., gears for aircraft parts, $62,000, 65%.
- **Longren Aircraft Co.**, Torrance, Calif., aircraft parts, $131,934, 65%.
- **Air Transport Mfg. Co.**, Los Angeles, aircraft components, $9,074, 65%.
- **V and M Precision Grinding Co.**, Los Angeles, aircraft parts, $12,350, 65%.

PRODUCTION BRIEFING

► **Aviation Accessories, Inc.**, Ft. Worth, has been awarded a contract to manufacture, assemble and test all the electronic wiring on Pioneer Air Lines' fleet of Martin 2-0-2s purchased from NWA.

► **Boeing Airplane Co.**, Seattle, plans to erect two buildings for USAF, costing $6.5 million, adjacent to the firm's plant. One is to be a materials preparation building, the other a maintenance, transportation and boiler structure.

► **Pratt & Whitney Aircraft Corp.**, New Haven, Conn., has scheduled movement of 11 production departments and their supporting services into company's new 700,000-sq. ft. plant this summer.

► **Rohr Aircraft Corp.**, Chula Vista, Calif., will begin construction of a $2,013,283 plant in Riverside, Calif., to turn out power packages for the Boeing KC-97. It will also spend some $750,000 on expansion of its Chula Vista location. Company backlog is $140 million, 92.2% of it military.

► **Tubesales**, Los Angeles, has appointed Elvin A. Svendsen, San Francisco, exclusive Northern California agent for handling steel pipe and tubing of carbon, alloy and stainless steel grades.

Here's How This JOY AXIVANE® Aircraft Fan Solved a Problem of Unmatched Complexity

WHEN the Air Force and Consolidated Vultee, manufacturer of the B-36, decided it was necessary to have a pressurization booster on this king-size bomber, they really threw the design-book away. The requirements for the blower would cause any prospective fan supplier to have misgivings. Specifications called for three separate fan-duties:

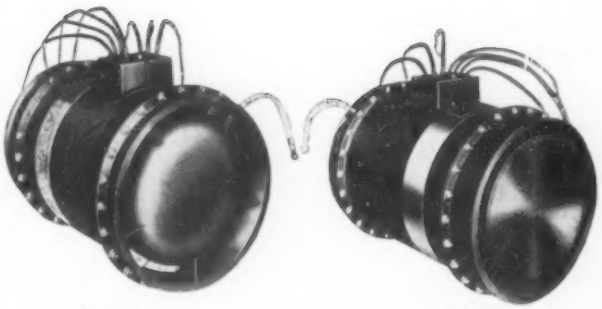
a *1180 CFM at 32" W.G., with an air density of 0.044 lbs./cu. ft.*

b *700 CFM at 40" W.G., with an air density of 0.10 lbs./cu. ft.*

c *680 CFM at 26" W.G., with an air density of 0.070 lbs./cu. ft.*

Space and weight limitations were stringent. The fan had to operate without excessive horsepower requirements due to a critical load on the generators. In addition, the fan motor had to be protected from hot air in the duct system.

Just about when the job seemed impossible, it was turned over to Joy engineers . . . and not only was the problem solved to the complete satisfaction of both the Air Force and the manufacturer, but the prototype fan was in their hands only six months after Joy received the order.



Front View **(INLET)** *Rear View* **(OUTLET)**

The fan exactly meets the three duties specified. It is 10" in diameter and 17" in length. Because of its combination of magnesium and aluminum construction, the fan weighs only 54 lbs. It is a two-stage unit, driven by a two-speed, 400-cycle motor. The efficiency of vaneaxial-fan design permits using a motor rated at only 12.6 H.P. continuous duty. The stationary vanes which support the motor are hollow, so that cooling air can be continuously directed over the motor. Each stage of the fan has a set of straightener vanes. Casing and hollow vanes are a single casting for shock-resistant strength.

● We freely admit that this is one of the toughest fan design-problems Joy engineers have ever tackled. On the other hand we are just as sure that, in the future, even harder problems will be taken on and solved. Even if your aircraft fan problem is not a difficult one, it is a good bet that the incomparable vaneaxial-fan design know-how which produced *this* AXIVANE fan will give you the most for *your* money. If you need an aircraft fan for any purpose, call on JOY—the world's largest manufacturer of vaneaxial fans.

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CAB Accident Investigation Report

Eastern Airlines, Inc., Miami, Fla.—Sept. 14, 1951

Released: Apr. 22, 1952

THE ACCIDENT

Eastern Air Lines' Flight 635W, a Douglas DC-4, N 75415, was involved in an accident while making a scheduled landing at Miami, Florida, at 0633,[1] September 14, 1951. Three crew members, 20 adult passengers, and one infant were on board; no one was injured. The aircraft was substantially damaged.

HISTORY OF THE FLIGHT

Flight 635W originated in Boston, Massachusetts, Sept. 13, 1951, with its destination Miami, Fla. Intermediate stops were scheduled at New York, N. Y.; Washington, D. C.; and Jacksonville, Fla., with a routine aircraft and crew change to be made at New York. The flight proceeded to New York and from there the crew consisted of Captain A. C. McDonough, Co-Pilot J. F. Reubert, and Flight Attendant R. K. Quinn. Departure from New York was made at 2313 the same day, and stops were made as scheduled at Washington and Jacksonville. On departing Jacksonville the total aircraft gross take-off weight was 54,671 pounds, which was within the allowable maximum gross weight of 65,705 pounds; all disposable load was distributed within the approved center of gravity limits. The flight to Miami was routine until the landing was made.

Throughout the entire flight the captain and co-pilot alternated flying the aircraft, and the last portion of the flight from the vicinity of Vero Beach, Fla., to Miami was flown by the co-pilot. Captain McDonough was seated in the left pilot's seat (his normal place in the cockpit) and was performing the usual co-pilot duties.

The crew stated that the IFR (Instrument Flight Rules) flight plan, in accordance with which the flight was flown from Jacksonville to Miami, was canceled when the aircraft neared Fort Lauderdale, Fla., and the remainder of the flight was flown VFR (Visual Flight Rules). A few minutes after canceling the flight plan, the flight was cleared to land on Runway 9L of the Miami International Airport. At an altitude of 1,200 feet the "in range" check was completed and the flaps were lowered 15 degrees. The captain said that he personally checked each item on the check list as it was accomplished. Entering the traffic pattern, the flight was again cleared for Runway 9L and a left turn was made to align the aircraft with this runway.

At an approximate altitude of 800 feet on the down-wind leg, the "before landing" check was made with the exception of lowering the landing gear, and the flaps were lowered to 30 degrees. Turning on final approach the co-pilot called for the landing gear to be lowered, and the captain said that he placed the landing gear lever in the full down position. He said, also, that he observed the landing gear red warning light go out, the three green warning lights come on, and that after checking and finding the hydraulic pressure to be normal, he placed the carburetor mixture controls in the full rich position. He then called to the co-pilot "gear down and locked, three green lights, mixtures rich, you are cleared to land." In addition he stated that the landing gear warning light dimming switch was at the dim position, as they had been flying through the hours of darkness, and that he placed this switch in the bright position and again observed the three green lights to be lighted.

At approximately 400 feet above the ground the co-pilot asked for full flaps. This was done and the aircraft was observed to approach the airport in a normal manner with the landing gear extended. When approximately 200 feet past the approach end of the runway a normal landing was made on the main landing gear wheels. The aircraft was then seen to travel a considerable distance, during which travel the landing gear was observed to retract, permitting the aircraft to settle on the bottom of its fuselage and slide to a stop. A flash fire which developed in number three engine nacelle, was quickly extinguished by the captain's use of an emergency portable hand CO$_2$ bottle and the airport's fire fighting equipment. All passengers were evacuated in an orderly manner.

The Miami weather at the time of the accident was ceiling unlimited, visibility 12 miles, wind north northwest three miles per hour.

INVESTIGATION

Runway 9L of the Miami International Airport is 7,364 feet long. The aircraft had come to rest 3,290 feet past the approach end of this runway. Because of tire marks from many aircraft on the runway it was impossible to determine where the aircraft initially touched down. First discernible runway marks were gouges made by the aircraft's inboard propellers. These marks were 1,856 feet east of the approach end of the runway, followed 25 feet farther on by similar marks made by the outboard propellers. Nine feet beyond these latter marks the bottom of the aircraft's fuselage made contact with the runway. From this point the aircraft skidded until it finally came to rest, heading in an easterly direction near the center of the runway, with the entire landing gear in an almost fully retracted position. Damage to the aircraft was confined largely to propeller blades, engine nacelles, the bottom of the fuselage, flaps and the main landing gear.

Upon arrival of the Board's investigators, a complete record of cockpit controls, switches and hydraulic pressure gauge indications was made. It was found that all switches, including the ignition, generator and battery switches, were in the OFF position. The carburetor mixture controls were at idle cutoff position and the carburetor air controls were in the cold position. The main auxiliary fuel and the fuel cross feed valves were off; and the hydraulic fluid by-pass and hand pump valves were closed. The emergency brake pressure gauge registered a normal 1,000 psi., and the hydraulic system pressure gauge registered a normal 1,200 psi. Other controls were positioned as follows: cowl flaps closed, propeller controls full forward, flap indicator and flap lever full down, landing gear lever down and the landing gear lever solenoid safety pin in the safe lock position, and the landing gear warning light switch at the bright position. An external examination of the aircraft revealed the flaps to be in the full down position and badly damaged by contact with the runway's surface.

In order to determine the extent of damage and to examine the landing gear, the aircraft was raised. It was found that the nose gear doors were damaged by contact with the runway; however, the nose gear itself was undamaged. When allowed to fall free, the nose gear extended to the full down position and locked. Examination of the main landing gear disclosed that the actuating cylinder rods of each gear's retract strut were bent approximately 90 degrees. These rods had retracted approximately five inches into their respective cylinders and were bent at a point where they emerged from the packing nuts. The lower drag links of each gear were also bent a few degrees. The

[1] All times referred to herein are Eastern Standard and based on the 24-hour clock.

If It Helps You. . . .

Publication of this official Civil Aeronautics Board report on an airline accident brings to light a type of aviation information which is seldom printed in full detail. If such reports help you we shall continue to publish them in as much detail as space permits. Your comments would be appreciated. Write: The Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y.

hydraulic fluid reservoir was examined and it contained a normal amount of fluid.

Functional tests were then performed. Since the main landing gear doors were also damaged, all doors were removed. The hydraulic system was connected to an outside power source and the bent main gear retract struts were disconnected from their respective landing gear assemblies. The nose gear was then extended and retracted under pressure. It operated in a normal manner and no fluid leaks were found. When pressure was applied, the actuating rods of the main landing gears retract struts extended their full travel distance and retracted in a normal manner until stopped by the bent portion of the rods. No fluid leak was found during this operation.

The damaged actuating rods and drag links were then replaced by similar new parts of correct lengths and tolerances and the gear was again tested under pressure. All three landing gears functioned in a normal manner. During this test the green warning light for the right landing gear did not operate; however, it was found that the micro switch operating arm for this light had been broken by impact and under finger pressure the light functioned in a normal manner. The hydraulic system from the landing gear selector valve to the reservoir was checked. No obstruction was found and the reservoir filter was clean. The fluid was drained from the reservoir and strained; no foreign matter was found. The two engine driven hydraulic pumps were removed and tested and found to function in a normal manner. The landing gear warning horn operated normally; however, the throttles had to be in the nearly closed position to actuate the horn.

The aircraft's maintenance records were reviewed and these indicated that normal inspections and maintenance had been performed. All airworthiness directives had been complied with.

The crew stated that the approach and the landing were made in the usual manner, that after the landing gear control lever was placed in the down position prior to landing it was not moved from that position, and also, that the landing gear warning horn did not sound at any time.

ANALYSIS

Since tests made subsequent to the accident showed that the aircraft's landing gear mechanism and hydraulic system was capable of functioning in a normal manner, it is necessary to analyze the system to determine what could cause the gear to retract under such conditions. Normal lowering of the landing gear is accomplished by moving the landing gear control lever, located in the pilot's cockpit, to the DOWN position. This mechanically releases the up-latches and permits hydraulic fluid under system pressure to enter the down-lines, and at the same time the fluid in the up-lines is allowed to return to the reservoir. The landing gear then extends and locks, and the system pressure builds up to 2,700-3,000 psi. As the down-latches engage, the green lights come on and the red warning light goes out. The landing gear is then held in the extended position by the down-latches and the system pressure which is applied to the down-lines. Strong spring bungees hold the down-latches in the locked position. The hydraulic fluid in the down-lines is then trapped by means of a check valve at the in-port of the control valve and cannot escape until the control valve is placed in the UP position.

Should hydraulic pressure be unavailable, the landing gear could extend and lock by its own weight by operating the control lever to the DOWN position. The design of the main landing gear is such that the weight of the aircraft will hold the gear in the extended and locked position. With the entire weight of the aircraft on the gear, the application of full system pressure applied to the up-lines will not retract the gear.

The nose gear down-latch is actuated by a spring-loaded hydraulic bungee cylinder. To unlock this gear, up-line pressure must overcome the force of the spring. With the weight of the aircraft on the gear, up-line pressure in excess of 2,500 psi. is required to unlock and retract the nose gear. When the weight of the aircraft is on the landing gear and the right main landing gear shock strut has been compressed, a safety switch actuates and engages the landing gear control lever safety latch. When this safety latch is engaged the landing gear control lever is locked in the DOWN position.

Since the crew stated that they observed the green warning lights to be on and since when subsequently tested the landing gear mechanism functioned properly, it can be assumed that at that time the gear was down and locked. From the above brief analysis of the landing gears operation it would be necessary, under the conditions described, for numerous simultaneous malfunctions to occur. Although the crew stated that the landing gear control lever was placed in the fully down position and was not moved again, it is probable that this lever was inadvertently moved upward instead of the flap control lever after landing. This must have occurred when wing lift was still present and there was insufficient weight on the landing gear strut to actuate the landing gear control lever safety latch. This is substantiated by the manner in which the actuating cylinder rods were partially retracted.

FINDINGS

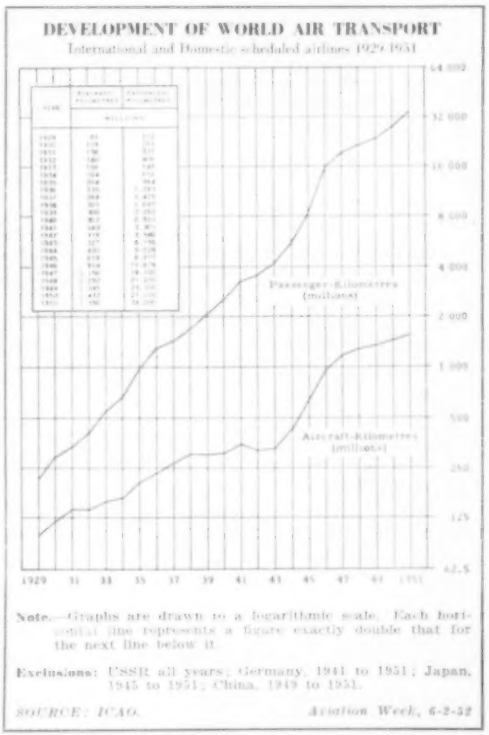
On the basis of all available evidence the Board finds that:

1. The carrier, the crew and the aircraft were properly certificated.
2. The co-pilot was sitting in the right pilot's seat and was flying the aircraft.
3. The flight was cleared to enter the Miami traffic pattern and landing gear was lowered.
4. Following the lowering of the landing gear, the green warning lights came on indicating the gear was fully extended and locked, pressure normal.
5. A normal landing was effected and during the landing roll the entire landing gear retracted.
6. The landing gear was found capable of functioning in a normal manner when tested after the accident.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was the inadvertent moving of the landing gear control lever upward during the landing roll, causing the landing gear to retract.

THE CIVIL AERONAUTICS BOARD



Note.—Graphs are drawn to a logarithmic scale. Each horizontal line represents a figure exactly double that for the next line below it.

Exclusions: USSR all years; Germany, 1941 to 1951; Japan, 1945 to 1951; China, 1949 to 1951.

SOURCE: ICAO. *Aviation Week*, 6-2-52

Collins 17L VHF aircraft radio transmitter

NOW! Full use of VHF radio by owners of executive aircraft

Civilian "non-carrier" pilots are no longer confined to VHF frequencies of 122.1-122.9 megacycles for air-to-ground radio communications. By amendment of its Rules and Regulations Governing Aeronautical Services, the FCC has enabled *all owners of aircraft regardless of type* to utilize certain frequencies within the band 118.1-126.7 megacycles.

Not only that! Under the new Controlled Materials Plan we are now authorized to use priority DO-J-6 to get materials with which to fill orders from corporation plane owners for Collins 17L transmitters.

The businessman can now equip himself to operate in the same way under instrument conditions as the scheduled airline.

The Collins 17L transmitter provides transmitting facilities on all channels reserved for aircraft communication in the VHF band. Its frequency range is 118.0-135.9 megacycles, and all of the 180 channels assigned in this range are easily selectable over a simple and positive remote control system. The power output on voice is conservatively rated at eight watts. With this power, and the greatly increased number of frequencies now available, the pilot is assured that transmissions will be received and answered at the busiest air terminals.

The 17L is a companion to the 51R navigation receiver with which many executive planes are already equipped. The pair provides reliable two-way radio telephone communication.

We will be glad to send you a more complete description of the 17L transmitter on request.

For reliable radio communications, it's . . .

COLLINS

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 W. 42nd St., NEW YORK 18 — 1937 Irving Blvd., DALLAS 2 — 2700 W. Olive Ave., BURBANK

SLOTTED STRIP keeps air from hitting prop blade flatly, eliminates zoom.

How Anti-Zoom Prop Reduces Noise

Details of a noise-cutting "anti-zoom" propeller have been released by Eddie La Tulippe, former chief engineer of Aero Sonic Corp., Brooklyn, and developer of an engine muffler recently demonstrated on a Meteor Air Transport C-46 (AVIATION WEEK Feb. 11, p. 38). La Tulippe has flight tested the device in his 450-hp. Howard cabin plane and hopes to have one soon for larger planes.

► **Noise Killer**—La Tulippe states that air striking the blade flatly or at special angles is responsible for the zooming noise from propellers. His blades can flap forward to a 60-deg. angle and can turn, changing their pitch, so that much vibration noise is eliminated. Here are the prop's special features:

• **Forward swinging blades** reduce vibration. Static thrust when the plane is braked prior to takeoff roll causes blades to swing forward so that they look something like the ribs of an inside out umbrella. After the plane starts moving, the blades gradually resume their position 90-deg. to the prop shaft.

By letting the blades swing like this on hinge points on the hub, vibration and blade flexing are greatly minimized, La Tulippe says, and prop efficiencies are improved. Takeoff run is reduced.

• **Pitch is controlled** by blade swing. Fore and aft swinging causes the blades to turn, through gearing in the hub, thus changing pitch. When blades swing full forward they also turn to takeoff pitch. When they swing back to normal they automatically turn to cruise pitch. They can be adjusted on the ground for any desired cruise pitch.

• **Slotted strip** on leading edge of blade directs air so it does not strike blade flatly or at zoom-producing angle.

• **Effective Tests**—The present prop is a Hamilton Standard ground-adjustable type formerly used on the old Ford Tri-Motors. It is a crude affair, La Tulippe states, with no feathering and with the slotted strips flush-bolted to the conventional blades. But the finished product would have the strips integral with the blade, and the hinge points, springs, etc., now exposed, would be buried in the hub.

In 150-hr. "swing" tests at Wright-Patterson AFB, the instrument needle for picking up prop vibration stood virtually still, indicating the new propeller's effectiveness, La Tulippe says.

La Tulippe told AVIATION WEEK last week he had left Aero Sonic and plans to continue propeller and aircraft muffler research as vice president and chief engineer of E. D. L. Aeronautical Corp., Englewood, N. J.

New Dye Process Speeds Inspection

Turco Products, Inc. has introduced a new dye inspection process, "Chek-Spek," designed to break bottlenecks and rapidly move large quantities of parts through factory inspection departments.

It supplements the firm's Dy/Chek process, but as it is engineered around plant procedures, Chek-Speking depends on factory equipment for effectiveness, while Dy/Chek is a self-sufficient "portable" process. High volume is the keynote for Chek-Spek; "flexibility" characterizes Dy/Chek, Turco says.

Chemicals in both processes can be applied by spraying, painting or dipping. Cost of equipment is fraction of that for other inspection methods, Turco says. Both Chek-Spek and Dy/Chek involve the use of a penetrating red dye applied, then removed from the metal surface, leaving an invisible residue in the cracks. This residue is drawn out of the cracks by a white developer, providing a sharp contrast for the telltale red markings which appear, clearly delineating and magnifying otherwise invisible cracks in the metal structure.

Turco Products, Inc., 832 E 62 St., Los Angeles 1, Calif.

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HIGH PRESSURE TRANSDUCERS
(Resistance Output)
Type 46139—small size, lightweight, rugged construction, made of materials to give long life.
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Standard Ranges and Resistance Value Absolute and differential 0-100 P.S.I. Min. to 0-6000 P.S.I. Max., Gage 0-100 P.S.I. Min. to 0-6000 P.S.I. Max. Resistance 2000 ohms. Other ranges and resistance values are available.
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From a small force of 41 employees and eight tiny Pitcairn Mailwing airplanes carrying mail to seven cities over a 792-mile route, Eastern Air Lines has soared to a leading position in commercial aviation. Today Eastern employs 9,100 . . . has a fleet of 100 airplanes including Super and New Type Constellations and Martin 4-0-4 twin engined airliners . . . and flies a route network that links 90 cities in 25 states, Mexico City and San Juan, Puerto Rico. More than to any other factor, this spectacular growth is due to *efficiency of operation*. Right from the outset Eastern applied the sound principles of rigid cost control to every phase of its ever growing organization. In communications, Eastern selected Bendix* Radio equipment in 1939 and has used it continuously ever since. If increased efficiency, double dependability and lower costs are among your goals, take a page from Eastern . . . install Bendix equipment.

*REG. U. S. PAT. OFF.

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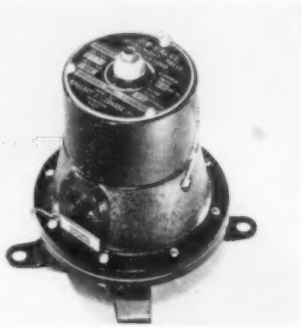
VHF Transmitters • H. F. Transmitters • Radio Control Panels • Antennas • Indicators • Automatic Radio Compasses • Marker Beacon Receivers • Announcing Systems • VHF Communication and Navigation Receivers • Intercommunication Systems • H. F. Receivers • Ground Controlled Approach Landing Systems • VHF Omni-Directional Range Systems.

NEW AVIATION PRODUCTS



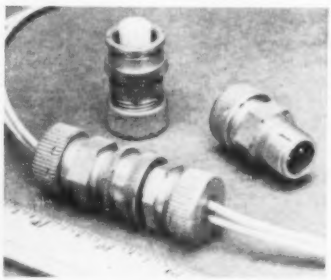
Rocket Air Control

A new air pressure regulator designed to feed a precise air supply to flight instruments, radar systems, rocket fuel tanks and similar airborne installations, has been announced by Wallace O. Leonard, Inc.

The regulator ties down widely varying air inlet supplies into a smooth, high-accuracy delivery, its maker says. It can, for example, take fluctuating high-pressure air tapped from the jet engine compressor section—varying anywhere from 3 psig. to 150 psig.—and slim it down to a constant delivery of 1 psig., accurate to 1.0 in. H.O. Leonard claims. Various valve models are available. The one with the performance described above meets Spec. MIL-V-5019.

The regulators are two-stage, direct-acting types and can be supplied as pressure differential or absolute pressure controllers.

Wallace O. Leonard, Inc., 373 S. Fair Oaks Ave., Pasadena 1, Calif.



Avionic Couplings

A new type of lightweight electrical connectors, designed to answer certain temperature, corrosion and vibration problems that can't be solved by other types, according to its maker, has been

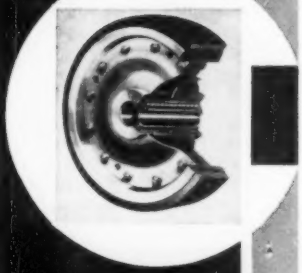
A SAVING AT EVERY TURN

DARNELL CASTERS

Increase efficiency of employees.

Eliminate wracking of equipment.

Save time, speed up production.



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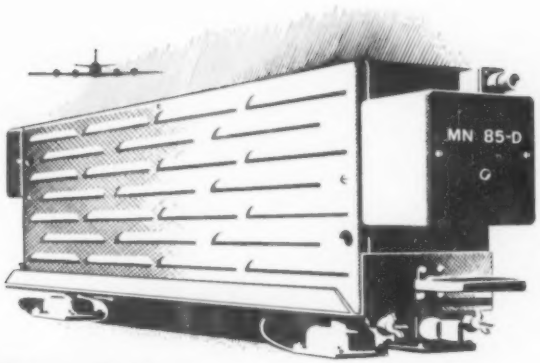

NA-3A

VHF NAVIGATION SYSTEM

NOW IN PRODUCTION FOR THE WORLD'S AIRLINES

The Bendix MN-85D VHF Receiver, pictured above, is the heart of the NA-3A Navigation System. It combines unexcelled performance with simplicity of design and ease of maintenance.

Finger-tip selection of 280 crystal-controlled localizer, VAR, VOR, and civil aviation communication channels.

Picture navigation with the Bendix Radio Omni-Mag, a simple indicator which provides selection of course line and automatically shows aircraft position and heading deviation from that line.

Rely on

Bendix Radio

most Trusted name in

BENDIX RADIO DIVISION of Bendix
BALTIMORE 4, MARYLAND

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, New York
Canadian Distributor: Radio Engineering Products, Ltd., 4305 Iberville Street, Montreal, Quebec.

placed on the market by Titeflex, Inc.

Suitable for AN applications, the connectors are claimed to eliminate clamps, save space, facilitate harness assembly and permit easy changes in wiring arrangements. Terminals can be removed from the connector block to solder or crimp the wires to the end of the terminal, eliminating the difficulty of making a connection in the confined space of the connector shell.

Only this connector presently provides the needed high-altitude and all-weather performance to meet certain engineering demands now arising in the aircraft field, Titeflex asserts.

The connector conforms to AN sizes 8 through 36 and can be furnished for cord connections, shielded assemblies and bulkhead or box mounting.

Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

Jet Engine Carton

A new shipping container for jet engines which is 50% lighter in weight than present types has been developed under Air Force contract by Bassons Industries Corp.

The container is made of Fiberglas impregnated with polyester resin, providing a tough, dent-proof surface. The engine is supported within the unit by special shock absorbers of the com-

YOUNG MEN OF VISION

Their future is based on decisions made today. The secret of success at Indiana Gear is to visualize . . . create . . . prove . . . and then move on to conquer the next problem. Indiana Gear proves from past success in a highly competitive business that its policy of using master craftsmen, fine equipment, skilled sub-contractors, and "young men of vision," exemplifies the perfectly coordinated planning so necessary to solve the gear problems of today.

INDIANA GEAR

The driven gear shown here is 5" in pitch diameter and 15" long overall. It is carburized and hardened with heat-treating distortion held within .001".

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It's coming!

An outstanding event for the aircraft industry in 1952!

INTERNATIONAL TRADE SHOW OF AIRCRAFT PARTS & EQUIPMENT

June 17, 18, 19, 1952

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JU6-1164
Cable address: "Airshows"

Engineering secrets are under her skin

This photo shows the first flight of the giant Boeing eight-jet YB-52. It's America's new all-jet heavy bomber, and another trail-blazing product of Boeing engineering leadership. Still highly classified, Boeing's most revolutionary developments are out of sight, under its gleaming skin.

The B-52, vital to America's defense plans, is just one of the challenging projects Boeing engineers are at work on. Others are guided missiles, supersonic research, and the B-47 Stratojet, now in quantity production.

If you measure up, you can share the prestige of Boeing leadership. You'll work with the men who have made major contributions to both civil and military aviation.

There are excellent openings, now, for experienced and junior engineers for aircraft

- **DESIGN**
- **RESEARCH**
- **DEVELOPMENT**
- **PRODUCTION**
- **TOOLING**

also for servo-mechanism and electronics designers and analysts, and for physicists and mathematicians with advanced degrees.

You can work either in Seattle, Washington, or Wichita, Kansas. Boeing provides a generous moving and travel allowance, gives you special training, and pays a good salary that grows with you. Boeing offers long-range careers in an aircraft company that has been growing steadily for 35 years.

You'll be proud to say, "I'm a Boeing engineer!"

Write today to the address below, or use the convenient coupon.

JOHN C. SANDERS, Staff Engineer—Personnel
Dept. E-6
Boeing Airplane Company, Seattle 14, Wash.

Engineering opportunities at Boeing interest me. Please send me further information.

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BOEING

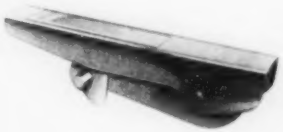
Here are just two of the many kinds of cloth tapes and paper masking tapes made by MYSTIK. They meet the toughest specifications demanded by the government—but they go beyond that. They're built to meet *your* needs . . . on the production line and for protective shipping. MYSTIK is *proved* under toughest conditions . . . MYSTIK Cloth Tapes supplied 65% of the total needs of industry and the armed forces during World War II. Write for full information and samples. Mystik Adhesive Products, 2643 N. Kildare, Chicago 39.

Mystik Cloth Tapes • Mystik Paper Masking Tapes • Mystik Protecto-Mask
Mystik Dri-Pipe • Mystik Spra-Mask • Mystik Sand-blast

pany's own make. The prototype is locked by metal clamps. It measures 12 ft. in length, about 5 ft. in diameter.

Basson says the production model will differ considerably from the prototype and will be lighter in weight. No metal braces will be used. Instead, ribs will be molded right into the container with locks so that the entire assembly will be only ¼ the weight of metal containers used now. The plastic was formed by a vacuum molding process.

Basson Industries Corp., 1432 W. Farms Rd., Bronx 60, N. Y.



Nacelle Latch

New latches for aircraft power packs and engine nacelles are being marketed by Hartwell Aviation Supply Co.

The latches can stand up to 10,000 lb. static tension and are available in straight, concave or convex types. They are designed to fit flush with the surface they are installed on. After the toggle mechanism locks in place, the applied load holds the latch closed. It is opened by depressing the flush handle (a tee-bolt and trigger arrangement).

Hartwell Aviation Supply Co., 9035 Venice Blvd., Los Angeles 34.

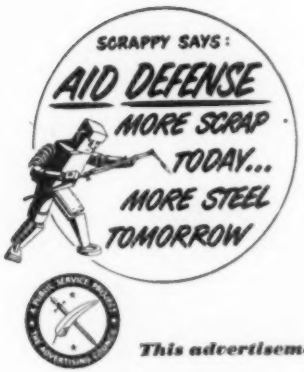
ALSO ON THE MARKET

Mabros positive corrosion inhibitor is claimed to protect ferrous and non-ferrous metals indefinitely once it is applied. Material can be added to paint and gasoline. Several prominent aircraft firms are testing it, says developer, Phillips Scientific Laboratories, North Arlington, N. J.

Hycar American rubber made by B. F. Goodrich is oil- and chemical-resistant sealing material for valves used in high octane fuel-handling systems. It is resistant to deterioration and abrasion, has positive vapor-sealing qualities. It is being used in a fuel-handling valve developed by Atwood and Merrill Co., Salem, Mass.

Brutex tracing cloth for engineering drafting work has a "super-velvet" pencil matte surface, provides clearer translucency, better drawing surface and greater durability than previous tracing papers, according to developer, Charles Bruning Co., Inc., Teterboro, N. J.

Part of the Mesabi Range may be **wasting away** in your plant



Natural resources don't last forever . . . not even the Mesabi Range.

But *you* can make them last *longer* . . . by helping to recover the *dormant* iron and steel wasting away in your plant.

Right now, more iron and steel *scrap* is needed than ever before to help maintain steel production. Lack of enough scrap—which normally represents 50% of the ingredients used in making new steel—would seriously hamper the nation in this critical period.

WHAT *YOU* CAN DO

To meet demands of military and civilian production, *your* help is needed. That means searching *your* plant for *more* scrap . . . any old idle iron and steel gathering dust and rust.

Your scrap is needed *now*.

Get *your* scrap salvage program going—*today*. Include non-ferrous scrap, too.

It tells how to conduct your own salvage program

For your copy, write to Advertising Council, 25 West 45 Street, New York 19, New York

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LOCKHEED

AIRCRAFT CORPORATION, GA. DIV., MARIETTA, GA.

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ENGINEERS with EXPERIENCE

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A New Opportunity, in a New Division, working for a top leader in commercial and military aviation.

A new joy in living, in famous North Georgia climate, only 8 miles from Atlanta, second highest large city in the U. S. 88 parks cover 1600 acres, and 22 excellent golf courses offer year-round enjoyment.

Atlanta and North Georgia are famous for their beautiful homes, and desirable, modern housing is available. Fine elementary and high schools, colleges and universities, plus vocational and professional schools serve the area. 10 radio and 3 television stations and more than 50 theatres bring in top entertainment. Best cultural advantages are offered, and 500 churches are affiliated with 40 creeds and denominations.

You will find a better life—a better future—at LOCKHEED.

(If you prefer the West Coast, your application will be promptly forwarded to LOCKHEED at Burbank, Calif., where similar openings are available.)

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Please send me full information on opportunities at LOCKHEED.

Name

Address

City & State

My Occupation (type of Engineer)

WHAT'S NEW

New Publications

Aircraft Data Chart GEN-60 plastic pocket-size slide chart provides specifications on 42 types of USAF and USN aircraft. It was prepared by General Electric Co.'s Aircraft Gas Turbine division. It also reproduces slide chart (prepared by Douglas Aircraft Co.) for quickly determining Mach number, true airspeed and ram air temperatures at various indicated airspeeds and latitudes.

It's available from Distribution Section, Advertising & Sales Promotion Dept., General Electric Co., Schenectady, N. Y.; price is 50 cents.

Strength of Metal Aircraft Elements, ANC-5, 1951 edition, is now available through the Supt. of Documents, Government Printing Office, Washington 25, D. C., price 55 cents.

Telling the Market

X-ray diffraction and Geiger counter X-ray **spectrometric equipment** is detailed in 60-page catalog, which also covers such components and accessories as tubes, rectifiers and cameras. Write Research & Control Instruments division, North American Philips Co., Inc., 750 So. Fulton Ave., Mt. Vernon, N. Y. . . . Semi-technical eight-page folder gives specifications and other information on the **Lear LTRA-6 communication and navigation system.** Write Lear, Inc., LearCal division, 11916 W. Pico Blvd., Los Angeles 64, Calif.

Brochure describing redesigned **Morey 12M vertical profiler and milling machine** which has had number of control gears reduced and vibration lowered is available from Morey Machinery Co., Inc., 410 Broome St., New York 13. . . . Alhead Cold Heading die steel, said to provide die life of double or triple that of other available steels, is described in **Alhead Tool Steel Blue Sheet** available from Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa. . . . **Catalog D-110** illustrates and describes the C-O Cincinnati 14-in. 3000 **sliding head floor drill** with tilting motor bracket for speed changes. Write Cincinnati Lathe & Tool Co., Cincinnati 9.

Catalog TH-5 giving basic information of **Carboloy Thermosistors** including applications and wiring diagrams is available from Carboloy department of General Electric Co., Detroit 32. . . .

Aimed at airport managers, **This Is International Steel,** details steel structures for airfield use. It is available from the International Steel Co., Evansville, Ind. . . . Data sheets on **hydraulic**

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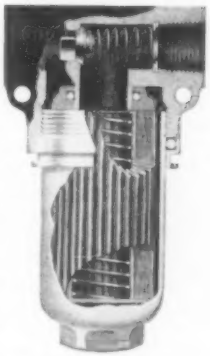
ORIGINATOR OF **MICRONIC** FILTRATION

Results Prove It

the *Finest*

Name in Filtering

Nine times out of ten ***Bendix-Skinner*** Filters will supply the "finest" answer to your filtration problems. Here are the facts: available with specially designed, resin impregnated cellulose elements; simple, quick replacement; high flow rate with minimum pressure loss; no channeling or bypassing; over 350 models providing filtration from ½ micron (.000019") upwards at flow rates from 1 to 5000 g.p.m. Why not let ***Bendix-Skinner*** filtration engineers work with you? Write us direct.



Airborne—light in weight. Available for operating pressures up to 3000 P.S.I. with integral by-pass. 10 Microns degree of filtration.

SKINNER PURIFIERS DIVISION OF Bendix AVIATION CORPORATION

1501 TROMBLY AVENUE, DETROIT 11, MICHIGAN

SAGINAW BALL BEARING SCREW JACK UP TO 97% EFFICIENT

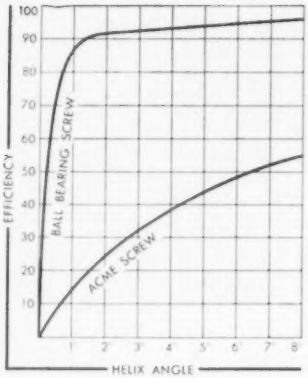
IN CONVERSION OF ROTARY TO LINEAR MOTION

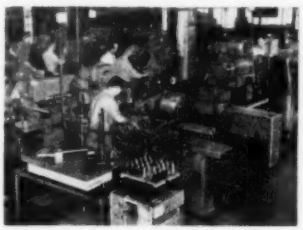
The Saginaw Ball Bearing Screw and Nut is the most efficient known method of converting rotary into linear motion. Almost friction-free, this device—of far greater efficiency than the Acme screw—is widely used in aircraft actuators.

The Saginaw Ball Bearing Screw and Nut offers many important advantages: Lower power to drive the actuator; lightness; higher speed in both directions, with less friction and heat; compactness; and a minimum of maintenance.

Each Application Specially Designed
This versatile actuator operates well under extreme loads and/or speeds in a wide range of aircraft applications. It is limited only by the power available. Because each application is a special problem, each individual actuator is designed to meet that problem.

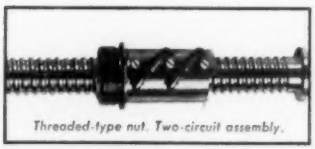
More-Than-Adequate Production Facilities
Saginaw Steering Gear Division has the machinery, skilled craftsmen, and complete inspection and engineering departments to produce in whatever quantities and at whatever speed your schedule calls for.



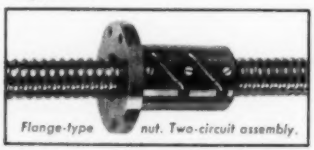


Extensive manufacturing facilities, plus many years of experience, make possible the outstanding high quality for which Saginaw Steering Gear products are famous.

Engineering facilities are complete. Engineers are specialists. The combination can develop a Ball Bearing Screw to meet your specific requirements.



Threaded-type nut. Two-circuit assembly.



Flange-type nut. Two-circuit assembly.

FEATURES
- Easy operation—Forward, Reverse
- Compact Design
- Low Power Requirement
- Light Weight
- Low Maintenance
- Wide Variety of Applications

WRITE TODAY for the new booklet that gives full details and engineering data on the ball bearing screw and nut principle. Saginaw Steering Gear Division, General Motors Corporation, Saginaw, Michigan.

Saginaw
STEERING GEAR DIVISION
General Motors Corporation, Saginaw, Michigan

SSG PRODUCTS
STEERING GEAR ASSEMBLIES
STEERING LINKAGE ASSEMBLIES
PROPELLER SHAFTS • DIESEL ENGINE AND AIRCRAFT PARTS

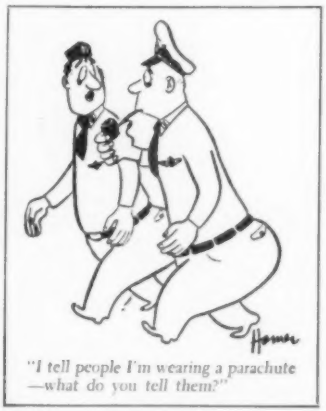
cone check valves for 1,500 and 3,000 psi. service can be obtained from Parker Aircraft Co., Los Angeles. . . . Complete catalog on line of single-, double- and triple-action **underdrive presses**, having clutch, brake and other major drive components below the floor is available from Danly Machine Specialties, Inc., 2100 So. Laramie Ave., Chicago 50, Ill.

Detailed specs of **aircraft cable, terminals and assemblies** may be had from Macwhyte Co., Kenosha, Wisc. Ask for **Catalog A-2**. . . . Colorful **welding equipment Catalog 20-C** gives complete information on Victor products. Write Victor Equipment Co., Welding Equipment division, 844-54 Folsom St., San Francisco 7, Calif. . . . **Technical Bulletin 13** gives properties, performance and detailed application data concerning Keystone **negative temperature coefficient resistance units** interrelating thermal and electrical behavior. Write Keystone Carbon Co., which is located in St. Marys, Pa.

Publications Received

• **The Aeroplane Directory of British Aviation, 1952 edition,** compiled by the Staff of The Aeroplane, published by Temple Press Ltd., Bowling Green Lane, London, E. C. 1, 15 shillings. A complete guide to aviation throughout the British Empire, its air forces, ministries, organizations, air lines, industries, flying clubs and aerodromes, together with a biographical section containing over 1,500 entries.

Engineers and Ivory Towers, by Hardy Cross, edited and arranged by Robert C. Goodpasture, McGraw-Hill Book Co., Inc., 330 West 42 St., New York 36, N. Y., 1952, $3.00. A dissertation on the relationship of engineer and engineering to science and the humanities. It touches on a wide range of subjects, including education, graduate study, the application of standardization, and the responsibilities and obligations of engineers.



"I tell people I'm wearing a parachute —what do you tell them?"

Douglas Airview News

LETTERS

Duo-Mono Interest

May we extend our sincere compliments to AVIATION WEEK and David Anderton for his excellent discussion of our Duo-Mono wing configuration Apr. 21. Mr. Anderton has demonstrated a keen appreciation of the aerodynamic principles involved and a refreshing grasp of its potentials with respect to aircraft performance in the subsonic regimes.

In view of the article in today's issue (Apr. 28) "Sixth '52 Crash Spurs New Safety Pleas," we know you will be pleased to learn of the interest some of the airlines and manufacturers are now displaying toward the configuration.

Some time ago, we invited each of the major scheduled airlines and the leading trans-port manufacturers to consider Duo-Mono as a possible solution to certain of the problems in aircraft design. Special emphasis was placed upon two features which Mr. Anderton subsequently stressed —resistance to stall and comparatively low landing speeds through greatly increased airplane drag when needed.

To date, the engineering departments of four airlines are studying it and two of the major manufacturers are calling for additional data which is now being prepared.

Typical comments from those sources: "We can see we are going to have to take this more seriously than we had any idea. . . . You seem to come closer to solution of the problem (low landing speed) than anything we have yet seen. . . . We want to take this apart to see what makes it tick. Then we will know how best to apply it."

We are confident that the Duo-Mono principle is destined to make a very definite contribution not only to safety in air transportation but to aircraft performance and utility in general.

CLINTON R. HARROWER
Pardel Development Corp.
221 Park Ave.
New York 17, N. Y.

So. Pac. Complains

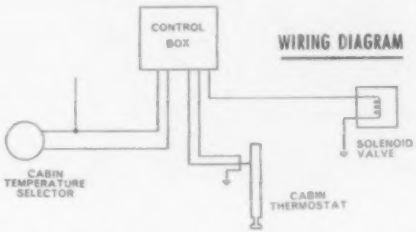
We were pleased to read, in your Feb. 11 issue, George Christian's interesting article about the California Central Airlines, and thought you would welcome having some factual railroad information relative to the comparison the article made of fares between San Francisco and Los Angeles. We consider this comparison quite misleading.

The statement is made that the air fare between San Francisco-Oakland and Los Angeles is $11.70 while rail fare is $11.84.

The rail fare of $11.84 is used primarily for interstate basing purposes, and Southern Pacific's patrons traveling between those California points on the company's most popular trains, offering coach accommodations, including the "Daylight" streamliners, have long enjoyed a lower fare. The one-way special coach fare between San Francisco-Oakland and Los Angeles is $7.50, plus a $1 reserved seat charge. On the company's "Owl", on which there is no reserved seat charge, the total coach fare is

Another Example of Vapor Control for Perfect Cabin-Temperature Comfort

Providing "living room" comfort in the sky for men of industry is the important assignment of the Vapor Temperature Control System used in the Beechcraft Twin-Bonanza (shown above, together with its military version, the USAF L-23), and many other owner-operated aircraft. And no wonder...it's so simple, so accurate! One Vapor Control Box and a single Vapor Thermostat control cabin heat. Vapor Control Systems give rapid response to extreme temperature changes. Control box design is adaptable to a wide range of requirements. On military and commercial aircraft, too, "Vapor" means perfection and accuracy.



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ENGINEERS NOTEBOOK

HEAT AND VENT SYSTEMS

(PHOTO COURTESY NORTH AMERICAN AVIATION)

QUICK COUPLING

handles pressure and temperature in de-icer system

Marman V-Band Couplings with patented Quick Coupler latches connect the shut-off valve, pressure limiting valve, and air supply line from engine compressor to anti-icing line in the F-86. In this application they are called upon to withstand pressures of 125 p.s.i. and temperatures of 600°F. This is one of thousands of applications where these standard couplings furnish a light weight, positive seal for tubing and ducting under difficult conditions of temperature, pressure, vibration and stress. The Quick Coupler latch insures maximum speed in assembly and disassembly. Marman's ten years of specialization in the design and production of clamps, straps and couplings of all kinds assure consistent and dependable quality.

FOR INFORMATION, WRITE DEPT. W-6

MARMAN PRODUCTS CO., Inc.
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WEST LOS ANGELES 64, CALIF.

SAVE TIME, WEIGHT, MONEY WITH MARMAN

$7.50 between those same points. (These fares do not include federal tax.)

The railroads make no pretense at competing with air service on a time basis, but Mr. Christian's comparison of 88 minutes for CCA as against "about 12 hours by train," seems to ignore the 9 hour 45 minute schedule of the "Daylight" streamliner on the company's coast line route between San Francisco-Oakland and Los Angeles.

K. C. Ingram, Assistant to the President
Southern Pacific Co.
65 Market St.
San Francisco 5, Calif.

(Mr. Christian's answer to this letter:

"I asked for the 'cheapest rate' and 'fastest time' between LA and SF. Phone clerks at both Grand Central and Pennsylvania stations agreed that $11.84 was the cheapest coach fare. They also agreed that the fastest trains took from 9 am. to 9 pm. to make the trip (or from 9 pm. to 9 am.). If information given out by railroad information clerks is so erroneous, maybe they should do something about it—they are hoodwinking the public, no less. It took me over one hour to obtain the information from the two stations, and when I asked one clerk if he would call me back (after having hung on the receiver for 15 minutes) he replied gruffly that they were too busy to call back. As busy as the airlines are, I have as yet to have a reservations clerk refuse to call me back—and promptly at that —and even courteously too.)

Permission Granted

We are desirous of obtaining permission to reproduce your editorial entitled "Everything Depends on Safety," appearing in the Apr. 14 issue of Aviation Week magazine.

We propose to distribute this editorial among the executives and flight personnel of the corporations we insure for various aviation coverages.

F. J. Crandell, Asst. Vice President
Liberty Mutual Insurance Co.
175 Berkeley St.
Boston 17, Mass.

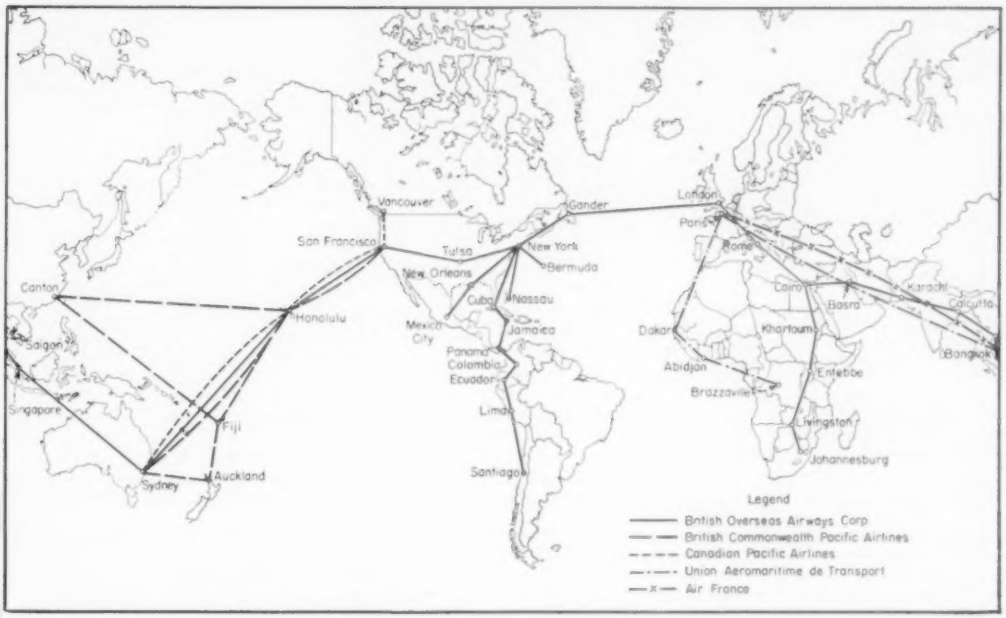
French Flying

I have in the past been a subscriber to your magazine which I consider to be the best in the field. Now that I am back in the Air Force I wish to subscribe once again. However, due to the slow delivery by surface transportation, I wish to have the magazine sent by airmail. I am quite willing to pay the additional charges.

At present I am stationed with Allied Air Forces Central Europe, forty miles southeast of Paris. I find private flying in France very popular though a bit expensive. The quality of French lightplanes appears, on the surface, to approach that of ours and considering the high cost of fuel and parts, rates for charter and rental service are not exorbitant. A J3 rents for about nine dollars an hour and aircraft comparable to our Bellanca Cruisair or Cruisemaster can be obtained for about fifteen dollars an hour.

I hope to be back home controlling traffic again for the CAA by Christmas.

2/Lt. Gerald E. Coldeln,
USAF Headquarters,
Allied Air Forces Central Europe
Fontainebleau, France



FOREIGN FLAG routes that will blanket the world flying British Comets are competitive with U. S. carriers using conventional planes.

U. S. Transport Building Lead Threatened

- **Comets pose real problem to American industry, and British are ahead in turboprops, Congress is told.**
- **But U. S. plane makers appear content giving top priority to assured market of military contracts.**

By Katherine Johnsen

U. S. manufacturers not only are lagging behind the British in fast long-range jet development, but, preoccupied with military orders, are risking loss of the world market for short and medium haul aircraft.

That is what testimony before the Senate Interstate and Foreign Commerce Committee added up to.

Civil Aeronautics Administrator Charles Horne told the committee;

Forty-five jet-powered Comets, already on order with Britain's de Havilland Aircraft Co. Ltd., will be flying airways throughout the world by late 1954. These lines have their orders in: British Overseas Airways Corp., Canadian Pacific Air Lines, British Commonwealth Pacific Airlines, Union Aeromaritime de Transport, Air France. BOAC already has the 500-mph. Comet in operation between London and Johannesburg; it will be put in Bermuda-New York operation this fall.

▶ **No Rush Here**—By comparison, even if a U. S. manufacturer started construction of a competitive jet tomorrow, it would be 1955, at the earliest, before the first planes were coming off the production line, and it would be at least 1957 before U. S. output matched the de Havilland rate.

But U. S. manufacturers, giving military orders, with an assured market, priority, aren't inclined to rush into the commercial jet field. The L-193 of Lockheed Aircraft Corp. and the 473 of Boeing Airplane Co. are "primarily engineering studies."

In turboprops, slower than jets but with greater load capacity, Great Britain has a similar lead over this country's manufacturers.

BOAC has orders for 26 long-range Britannias with Bristol Aeroplane Co., expects to have them in trans-Atlantic operation starting in 1954. The comparable Lockheed turboprop Super Constellation won't be flown for another year, and it will be several years before it is ready for commercial operations.

▶ **Viscount Is Near**—In medium-range turboprops, the Viscount, now being produced by Vickers-Armstrongs, Ltd. for British European Airways, Air France, and Aer Lingus, is due for scheduled operations late this year. The only comparable U. S. plane that has been flown, the Convair Turboliner, has accumulated less than 100 hr. of flying and is slated to remain in demonstration and test work "for several years."

T. H. Davis, president of Piedmont Airlines, speaking for local carriers now limping along with uneconomical obsolescent DC-3s, reported that two foreign firms are preparing to come to their rescue with a replacement that

Principal Characteristics of Civil Jet Transports —Approximate Values—

Manufacturer & Model	de Havilland Comet I	de Havilland Comet II	Avro Jetliner	Lockheed L-193	Boeing 473	Comparative[1] Piston Engine Airplane Values Douglas DC-6B
Powerplant	four Ghost I @ 5,000 lb.	four Rolls Avon @ 6,500 lb.	four Rolls Derwent 5 @ 3,600 lb.	four 12,000-lb. jet engines	four 9,250-lb. jet engines	four R2800
Gross Weight	105,000 lb.	115,000 to 120,000 lb.	65,000 lb.	148,000 lb.	135,000 lb.	107,000 lb.
Typical Payload and	13,500 lb. 36 pass.	13,500 lb.	10,000 lb. 40 pass.	14,800 lb. 48 pass.	16,000 lb. 60 pass.	14,000 lb. 54 pass.
Distance (miles)	1,500[2]	2,250	600		2,000	2,700
Cruising Speed	About 470 mph.	About 500 mph.	430 mph.	564 mph.	500 mph.	285 mph.
Altitude	35,000 ft.	40,000 ft.	30,000 ft.	35,000 ft.	40,000 ft.	20,000 ft.
Field Size	6,300 ft.	——	Approx. 5,000 ft.	5,000 ft.	6,150 ft.	6,350 ft.
Initial Cost	£450,000 ($1,260,000)	£515,000 ($1,442,000)	——	——	Around[3] $2,500,000	$1,100,000
Direct Operating Cost (cents per ton mile)	May be up to 30% higher than DC-6B	——	$0.13	Less than DC-6B	$0.10	Approx. $0.14 (Approx. $0.10 in domestic operation)

[1] Based on over-ocean operation.
[2] Comet being operated on London-South Africa route with a 7,000-lb. payload over a 1,360-mi. maximum stage length.
[3] Based on production of 100 aircraft.

Source: *Civil Aeronautics Administration.*

COMPARISON of British Comets I and II, the Canadian Jetliner and two projected U. S. jet transports, Lockheed L-193 and Boeing 473.

would enable them to operate profitably and without the heavy government subsidization they now rely on.

With the aircraft proposed by Canadair, Ltd. of Montreal and the Fokker Co. of Amsterdam, Davis estimated, local lines could operate at a profit with "the reasonably attainable load factor of 50 to 60%," while operations with the DC-3 require "an almost unattainable load factor of 85 or 90% to barely break even."

► **Canadair's Entry**—He reported:

Canadair is simultaneously moving forward with construction of a full-scale mockup of its CL-21, embodying all of the basic requirements for shorthaul transport and also suitable for economic mediumhaul operations, and a survey of the world market for such a plane.

Its characteristics: A two-engine airplane of approximately 32,000 lb. gross weight, with a capacity for 32 passengers, plus 2,000 lb. of cargo, having a range of 300 mi. with the fuel reserves prescribed by Civil Aeronautics Administration regulations, and able to operate from 3,500-ft. runways at sea level.

Adm. L. B. Richardson, vice president of General Dynamics Corp., parent corporation of Canadair, observed: "When we decided to go into the commercial transport field, engineering studies and preliminary analyses of world markets led us to the conclusion that our best prospects would be with an airplane of a type different from any being developed or produced here.

"We also concluded that the requirements for heavy, long-range transport airplanes were or would soon be well satisfied by companies in the U. S. and in Great Britain. For many years it has been well recognized that eventually there would be a definite demand for an airplane to replace the DC-3 throughout the world."

Canadair will make a final decision as to whether to go into mass production of the CL-21 this December. If it does, first deliveries will be coming off the lines by the fall of 1954.

► **Dutch Entry**—The Fokker Co., one of the oldest manufacturers of aircraft in the world, is ready to take orders for the 28-passenger turboprop high-wing F-27. A full-scale mockup has already been built. Its cost: about half the $400,000 to $600,000 U. S. manufacturers estimate for a comparable shorthaul plane to replace the DC-3, because of substantially lower European wages.

Davis, who heads a committee of local service operators that have already canvassed five top U. S. manufacturers —Boeing, Consolidated Vultee Aircraft, Douglas Aircraft Co., Fairchild Aircraft and Engine Corp. and Lockheed—in search of a DC-3 successor, reported:

"Without exception, all of the domestic companies said that their shortage of engineering talent was so acute that it would be impossible for them to begin work on a shorthaul commercial plane for at least a year."

► **Tariff Problems**—The two stumbling blocks to foreign purchasing: tariffs and less accessible service facilities and sources for spare parts.

Chairman Edwin Johnson of the Senate committee, though long a high tariff advocate, suggested: "If no American company undertakes manufacture, I don't think there would be much difficulty with the tariff angle."

To solve the other difficulty, Fokker is considering the licensing of a domestic manufacturer to handle service and spares requirements in this country.

Other testimony:

James M. Souby, general solicitor of the Association of American Railroads, opposing any government assistance for the development of new transport types, said, "The only real problem now presented with respect to transportation subsidies is the problem of devising satisfactory methods for their elimination. That being true, certainly this is no time for Congress to concern itself with measures which would serve greatly to intensify this problem by providing for additional forms of subsidy to the airlines."

Comet Training

London—BOAC last month began operating a series of Comet overseas development and training flights between London and Singapore preparatory to opening scheduled jet airliner service between the two cities.

Argonauts, presently used in London-Singapore service, take 60 hr. to make the trip, including an overnight stop. Comets are expected to fly the route in less than 30 hr.

► **Other Views**—Amos Heacock, president of Air Coach Transport Assn., urged the establishment of a $100-million government corporation to purchase new transport aircraft for lease to qualified operators.

Jack Garrett Scott, new Undersecretary of Commerce for Transportation, opposing government financing of development of new transport prototypes at this time, said: "It is probable that private capital may effectively accomplish the job as they have done in the past. And also, it is possible that adequate prototype development will be contributed by the Department of Defense, in time for general use."

Warren Lee Pierson, chairman of the board of Trans World Airlines, recommended legislation directing USAF to buy and test new commercial types adaptable to military use. But, he added, "still another approach to the problem would be for the Civil Aeronautics Board to permit the airlines a level of earnings such that they could attract the capital necessary to embark on a jet development program."

Egypt Signs ICAO Pact

(McGraw-Hill World News)

Cairo—After a year of delays, a technical assistance agreement covering aviation and meteorology has been signed between Egypt and the International Civil Aviation Organization.

Approximately a dozen international experts in these fields are expected to arrive in Egypt soon to study local conditions and make a report which will recommend changes. They will also train local technicians in the use and maintenance of modern equipment.

Egypt is likely to become the training center for the Middle East on aviation technical matters as a result of the agreement.

PAA, TACA to Sign Guatemala Pacts

(McGraw-Hill World News)

Guatemala City—Semi-permanent formal agreements permitting Pan American World Airways and TACA International Airlines, El Salvador airline, to serve Guatemala are scheduled to be signed "very shortly," according to Guatemala's Minister of Economy. Both carriers have been operating into this country for the past two years on a day-to-day landing permit basis.

It is expected that Aviateca, the government-controlled airline, soon will apply for permission to make scheduled flights to the United States, and no difficulty is foreseen.

SILVER CITY FREIGHTER load two more cars for trip across English Channel as . . .

British Run Successful Air Ferry

An interesting combination airfreight-passenger business which could probably be tailored for use elsewhere has been developed with remarkable success within a few years by an enterprising British carrier, Silver City Skyways.

► **Channel Ferry**—The service: Providing an aerial ferry across the busy English Channel for tourists and their cars, motorcycles and bikes; vehicle deliveries to dealers on the Continent; hauling of livestock and perishable foods.

Silver City started with one twin-engine Bristol Freighter in July, 1948. Today it operates eight and is spending more than $1.5 million for six more specially modified to its operation. And the carrier is thinking of much bigger equipment and considering how the helicopter can fit into its operation.

During its first summer Silver City carried 178 cars and their occupants; last year it flew nearly 13,000 vehicles and 30,000 passengers across the gap separating Britain from the Continent. It has also added two routes to the original 47-mi. air bridge linking Lympe Airport in Southeast England with the French resort town of Le Touquet.

► **Simple System**—Silver City has pared the operation down to where it is this simple: The motorist arrives at the field a half hour before departure time, has his foreign touring documents checked (combined on a single document, including car and passengers to simplify ticketing and goes through customs. The carrier then takes the car over, drives it up the ramp into the plane and shackles it down using crossover chains with quick-acting tensions that grip each tire.

The normal load consists of two cars, one or two motorcycles, and their passengers. The rates are: Lympe-Le Touquet, small car, $33.60; large car, $67.20; motorcycle, $11.20; bicycle, $2.80; passenger, $6. From Southampton to Cherbourg or Southend-Ostend (92 mi.) they are, respectively, $42, $75.60, $14, $3.50 and $10.50.

Two of Britain's top automobile firms, Rootes and Ford, have shipped hundreds of cars to the Continent using Silver City. A large Paris dealer promises 24-hour delivery from the English factory to the Champs Elysees.

Silver City gets its message across to the public by working with Britain's two top motoring organizations where prospective visitors to the Continent must go to make their customs arrangements and has pacts with nearly 300 travel agencies in Britain and abroad.

Loading is simplified by compiling a list of centers of gravity for all makes of cars in inches aft of the front axle—the manufacturers provide this data. The plane's freight hold is then split up into marked stations; with a suitable slide rule type of trim card all variations of load can be quickly spotted and center of gravity determined.

► **Utilization Low**—Aircraft utilization, in terms of hours per year, is low—this year it will run between 800-900 hr. Landings come to about 1,700. Reasons include the seasonal nature of the operation and the fact that daylight schedules are adhered to. But advance bookings indicate another profitable year, with estimates running to 130 services on some days.

Last summer, Silver City flew so many cars in and out of Lympe that this field accounted for more tons of airfreight in some months than all six main London airports combined.

For the future, the carrier foresees that it will be economical to operate over a 150-175-mi. stage length with a four-engine transport carrying six cars. The next stage envisages a twin-engine helicopter which would have a passenger cabin and a pod carrying 2 cars. The pod could be cleared through customs and loaded before the upper half "prime mover" came along to airlift it.

Pay Problem Delays Modification Plans

Latest problem in Air Force planning of airliner modification for airlift reserve is whether AF can pay for equipment that may later be sold to foreign countries.

Air Force claims it can't pay for something over which it has no re-sale control, and hence may want to stipulate that the airliners modified at AF expense can't later be sold abroad, unless the extra equipment is removed.

But in two years of airlift reserve planning since Korea and Pacific airlift started, only this problem and a few other details remain unsettled.

▶ **Plane Switch**—Interim plans are ready for immediate mobilization now, even though final contracts aren't settled.

Most of the planes needing modification for the long San Francisco-Honolulu flight are DC-4s. If mobilization came before modifications were completed—or started—the airlines would be called on to send longer-range DC-6s and Constellations instead. Airlines whose DC-6s are short range would lease their quota to other airlines that send long-range planes into the airlift.

Other mobilization plans almost ready for finalization are the war risk insurance for crews and planes and the operating airlift contracts.

▶ **Insurance Plans**—War risk insurance terms are in near-final draft form now; the insurance could go into effect now, if needed. Consulting with Defense Air Transport Administration on the insurance terms is John E. J. Clair, formerly insurance expert with Pan American.

The airlift charter contracts probably will be about the same as the present contracts of the Pacific airlift. Signing of the final standby contracts for airlift operation on M-Day awaits settlement on modification contracts.

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CAB Wins Route Suspension Decision

Civil Aeronautics Board has won the first round in the court case that will decide whether the Board can suspend an airline's route certificate against the will of the airline (AVIATION WEEK Mar. 24, p. 80).

The U. S. Ninth Circuit Court of Appeals in San Francisco ruled that CAB had the power to suspend Western Air Lines' service to El Centro and Yuma and turn it over to Bonanza Air Lines.

On June 11, United Air Lines and CAB argue a similar case before the Seventh Circuit Court in Chicago. United contests CAB's suspension of UAL service to Rock Springs, Wyo., and Red Bluff, Eureka, Monterey and Santa Barbara, Calif. Frontier Airlines serves Rock Spring; Southwest Airways serves the other cities.

United and Western believe these suspensions set a precedent. The cities at issue aren't important to them, but once a precedent is set, the airlines fear a later Board might use that power to rearrange airline routes at will "in the public interest."

Egypt's Airports To Be Improved

(McGraw-Hill World News)

Cairo—The Egyptian Civil Aviation Department is making plans to have two of its top airports readied for the jet airliner age.

Two big new runways are under study for Alexandria's Fuad International Airport and one for Cairo's Farouk Airport. Already new customs, quarantine and immigration buildings have been built at Fuad at a cost of $100,000, with plans being considered for a hotel for overnight air passengers.

Farouk Airport is destined to get a big central administration building to provide space for administrative and technical departments. The design will be open to international competition.

Aviateca Reorganizes

(*McGraw-Hill World News*)

Guatemala City—In line with reorganization of Guatemala's flag line, Aviateca, its new general manager Ricardo R. Paul has placed former chief of operations Charles Hirst in charge of international operations and put Col. M. A. Ponciano in charge of domestic flying.

Investigation of the carrier's financial affairs continues with alleged defalcations expected to reach $200,000. Aviateca's former president and general manager, Col. Gonzalo Yurrita, and several other employes have been released on bail.

There are plans to increase the airline's fleet of 11 DC-3s and C-46s with financial assistance from the government.

Ramspeck to Decide Later on ATA Post

Robert Ramspeck, Air Transport Assn. executive vice president on leave of absence while serving as chairman of the U. S. Civil Service Commission, says he will decide late this month whether to return to ATA July 1 or remain on the commission.

His leave of absence from ATA expires June 30. Both the President and ATA reportedly want his services.

The ATA board of directors meets June 24. ATA President Emory S. Land had planned to retire last year but was persuaded to take another hitch to next Dec. 31 because of Ramspeck's appointment to the Civil Service Commission.

AA Sues to Protect Corporate Name

American Airlines has filed suit in U.S. District Court, New Jersey division, asking that European-American Airlines be restrained from using the words "American Airlines" in its name.

American's petition asks the court to prohibit any of other airline from using the words "American," "American Air" and "American Airlines" in its title.

However, European-American, applicant for an all-cargo trans-Atlantic shuttle certificate from CAB, points out that no suits have been filed against other companies with those words in their names—North American Aviation, Pan American World Airways or North American Airlines (a nonsked aircoach agency ifi direct competition with American Airlines).

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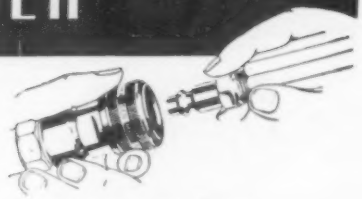

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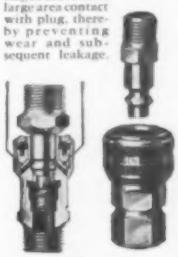

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United Negotiating Purchase of DC-7s

United Air Lines is negotiating to buy 25 Douglas DC-7s and has ordered 10 more Convair 340s. Total cost of the fleet expansion is $56 million—$50 million for DC-7s and $6 million for Convairs.

United's news release did not specifically mention the type four-engine transport it is seeking, which led to speculation the company may be considering modifications to the basic DC-7. However, Douglas Aircraft is reported urging United to stick with the basic design already ordered by American, National and Delta.

UAL previously had firmed up its decision to buy at least 15 DC-7s (AVIATION WEEK May 26, p. 7).

The 10 new Convairs will bring United's 340 fleet to 50.

Puerto Rico Field

(*McGraw-Hill World News*)

San Juan—U.S. Navy has ceded Vieques Airport, which it built here, for use by civilian aircraft including private planes. Airlines and individuals using the field must carry insurance acceptable to the Navy.

An auxiliary runway near Isabel II, Vieques, is under consideration.

Alaskan Nonsked Wins Libel Suit

Golden North Airways, Inc., Alaskan nonscheduled airline, has been awarded $25,000 judgment against the Fairbanks News-Miner in a libel suit brought after the newspaper attacked nonskdes.

Golden North said an editorial in the newspaper tended to deprive the airline of the "benefits of public confidence, respect and esteem and to impair its usefulness and its position as a duly certified nonscheduled air carrier."

The company asked $50,000 damages, but the District Court cut the figure in half.

ANA Sets New Cargo Gains

Australian National Airways has registered another big gain in freight traffic—its 1951 figures show air cargo went up 13 million lb. over the previous year to set a new high of 72,728,378 lb.

Flying three Bristol Freighters and three DC-3s on a 'round-the-clock basis, ANA's monthly freight average since June, 1951, has been 7 million lb. The cargo fleet flies 112 scheduled flights and about 25 special flights weekly over the airline's 11,176 route-mile network in Australia.

CPA Cargo Plans

When Canadian Pacific Airlines gets its six DC-6Bs and two DH Comets next year the carrier will begin development of trans-Pacific freight services to Japan, Hong Kong and Australasia, Canadian Pacific Railway President W. A. Mather stated at an annual meeting in Montreal recently.

Put Your Scrap Back to Work

NEW PLANES MEAN NEW BUSES

British European Airways has taken delivery on the first of 50 new 37-seat buses (above) to replace its present 18-seat vehicles for transporting passengers to and from the two main London airports. Bigger equipment is necessary to serve larger Airspeed Ambassador transports BEA is putting into service. The new double-deck coach is approximately 30 ft. long, 8 ft. wide and 12 ft. high. It features a large luggage compartment at the rear of the body (bracketed by tail-lights) capable of taking 100 full-size suitcases. The stowage space has no sharp corners and is padded with rubber.

SHORTLINES

▶ **Air Coach Transport Assn.** says non-skeds flew 1,093,365,091 passenger miles in 1951 compared with 761,065,793 in 1950 and 456,314,086 in 1949. Non-sked business in 1951 totaled $62 million. . . . ACTA did $2,380,888 of official military traffic business the six months to this Mar. 31, but commercial business slacked.

▶ **Air Line Pilots Assn.** retirement of former President David Behncke and election of President Clarence Sayen was legal and orderly, the U. S. District Court in Chicago is advised by master of chancery.

▶ **Air Transport Assn.** awards for airline employe weather research in 1951 go to: S. M. Serebreny, PAA, $250 (jet air streams); Ralph Meeker, Jr., AA, $150 (cyclones), and Charles Urger, AA, $100 (fog).

▶ **American Air Transport and Flight School, Inc.,** will have its letter of registration revoked if CAB adopts the recommendation of its examiner.

▶ **American Airlines** traffic is "presently excellent," Vice President and Treasurer W. J. Hogan told stockholders May 20. Expenses are still rising but slower than before. Second quarter earnings depend on how long the fuel shortage lasts.

▶ **California Central Airlines** set a new traffic record in April, carrying 17,411 passengers–up 74% from a year ago. Load factor was 80%. Former record was December with 16,707 passengers.

▶ **Central Airlines** reports April load factor of 21%, carrying 3,394 passengers. March load was 17%.

▶ **Flying Tiger Line** April scheduled air freight revenues of $433,000 are 23% over a year ago. January-April total: $1,567,000. These figures don't include military or commercial contract operations or outside maintenance.

▶ **Los Angeles Airways** operating expenses this March were up to $1.42 per copter mile, compared with $1.08 a year ago. Revenue miles flown were down to 21,729 compared with 31,817 in March, 1951.

▶ **Mid-West Airlines** ceased operations May 15. CAB had denied its certificate renewal application, effective July 1. Purdue Research Foundation recently bought the airline for $60,000 with CAB approval.

▶ **Northwest Airlines** minority stockholders who voted against merging with Capital Airlines are being checked by CAB to see if any of them had divided interests due to interlocking directorships.

▶ **Pan American World Airways'** three all-cargo DC-6As are scheduled for delivery April, June and July of 1954. PanAm has been chartering a Slick DC-6A recently.

▶ **Pan American-Grace Airways** has started flying new DC-6Bs on its New York-Buenos Aires tourist service, round-trip $675 via either South American coast with stop-over privileges. . . . Has ordered two more DC-6Bs for delivery February and March, 1954.

▶ **Transocean Airlines** is flying two trans-Atlantic all-cargo flights a week for Scandinavian Airlines System, N. Y.-Copenhagen.

▶ **U. S. Weather Bureau** installation of two more squall-spotting radars–at Goodland and Dodge City, Kan., make 25 total so far. Bureau puts in about five a year, using surplus equipment and spare shop time. Pilots calling these stations get guidance around local storm centers.

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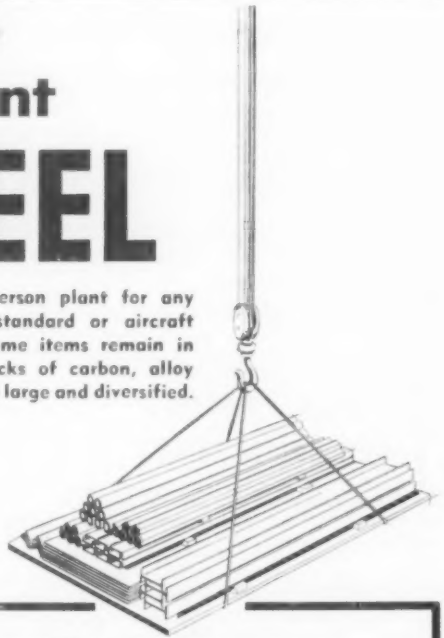

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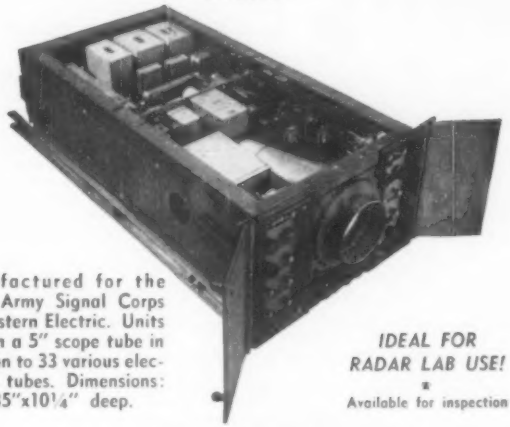

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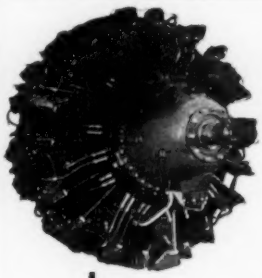

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407	SF9LN-2 (manufacturer's part No. 10-12453-6 Spec. AN9511)	Bendix Scintilla Magneto
42	SF5RN-12 (manufacturer's part No. 10-20170-1)	Bendix Scintilla Magneto
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814	35814	Blower Ass'y
53	48362	Shaft
175	48363	Shaft
56	48392	Sump
390	48461	Gear
78	76936	Gear
1178	84289	Bearing
113	84487	Housing
77	84591C	Nose Housing
200	48350-D	Crankcase Ass'y
200	84083	Cylinder
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700	TFD 8600	Thompson	Fuel Booster Pump
125	D7818	Adel	Anti-icer Pump
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97	6041H-146A	Cutler Hammer	Relay (B-12)
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SO THEY TELL US

(AVIATION WEEK's staff members here and abroad were interviewing authoritative military, industry and civil aviation people last week, as every week. Christian was in Japan and Korea, Stone was in Canada, McSurely was in Cleveland, Wood was in Washington, Kroger was back from England, France and Germany. Here are some of the items the staff was told.)

Military

Reports from two unrelated sources (not including the manufacturer) say the B-52 has exceeded expectations in flight tests to date. One usually well-informed government official even guesses that the B-47 program may be scaled down, and the B-52 program increased, if B-52 tests continue as successful.

That new thesis in thermodynamics developed by Prof. Neil Bailey of Rensselaer Polytechnic Institute (outlined in AVIATION WEEK March 3) is the subject of controversy among advanced engineers, including some at MIT.

A well-known New York military commentator asked about rumors that Secretary Finletter was resigning. The Secretary himself said emphatically that he isn't quitting unless he is dismissed by this or another Administration, and that the same goes for Undersecretary Gilpatric.

Some high Air Force people are unhappy about Curtiss-Wright management and want some changes. Unverified reports say Paul Shields, formerly chief executive officer, may take the reins again.

Brig. Gen. Sory Smith's term, which would have expired next month, has been extended by Secretary Finletter for another year and he will continue as top USAF PIO.

Washington Pentagon sources say Gen. Twining will remain Acting Chief of Staff during Gen. Vandenberg's "convalescence," and that Gen. LeMay will remain at SAC. There will be no Acting Vice Chief, it's said. Meanwhile, a top subject of Pentagon speculation is whether it will be Twining or LeMay who will win out as next chief. Temporarily, at least, we find LeMay's stock has dropped.

Important crash fire tests involving military aircraft have been underway for months by NACA's Cleveland labs. But the Air Force, as usual, has clamped deep secrecy over the project, even though some lessons important to civil aviation have been learned.

Air Force information officers still take the official line of underplaying Gen. Vandenberg's illness, which we hear is serious even though he is supposed to be up and about somewhat.

Military people say the first Grumman Jaguar (XF10F) was flown to Edwards AFB several weeks ago in a C-124. USAF officers in Washington express disappointment in the Westinghouse J40 engine, whose best power output is said to be well below the anticipated 7000-plus lb.

International

A Canadian industry official says the Comet has been taken to 48,000 ft. and has attained Mach 0.84 (about 556 mph.) in a shallow dive. As a result of this, and other considerations, the source says BOAC has cleared it for Mach 0.86 (about 569 mph.) in this type of maneuver. Some idea of what temperatures jet transports will encounter is indicated in a recent experience in which the Comet ran into an outside temperature of −67C (about −88F) at 43,000 ft.

British de Havilland officials, whether justified in the belief or not, fully expect Lockheed and Boeing to unveil completed jet transport prototypes well before the generally discussed 1955 date—just as the Comet was wheeled out as a surprise even to well-informed people in 1949.

Series I Comet, No. 16, is now the latest plane on the production floor at de Havilland. A total of 19 Series I are being built, plus two prototypes. Signs are that production is picking up—perhaps to better than two Comets a month next year. By 1955, when Short should be turning out close to two Series II's a month, DH hopes there will be some buyers.

A new Berlin airlift (provided the Allies could mount one) would not be sufficient to break any future Russian blockade of the former German capital, observers in Germany say. The 1948-49 airlift succeeded chiefly because we also were blockading the Russians' rail and road links through Berlin to the Russian Zone west of the city. Now the Russians have built new roads bypassing Berlin and they wouldn't be hurt by an Allied counter-blockade, we're told.

Airline circles in Europe say TWA has shown interest in 30 Comets for domestic U. S. routes, but TWA wants them quick or not at all, and at this moment such production doesn't appear in the cards.

A scramble is on to sell the new German airline used transports from the U. S.

Wright Field has tested the Safe Flight stall warning-speed control system on a B-47 but USAF uses only a flashing light indicator. Manufacturer thinks an installation should have a stick-shaker, amber light and audible signals for best results. A B-47 is being set up with this installation for evaluation at Eglin AFB. One official of the maker says for every 5 knots of approach speed above optimum, the B-47 takes 1,700 ft. more of runway. Navy is equipping a complete F2H Banshee squadron with stall warning-speed control for evaluation following favorable tests at Patuxent.

Air Transport

Slick Airways in the first 20 days of May hung up a record system load factor 90.7%, thanks to good business and some flight curtailments due to the gas strike. Line flew 374,665 plane miles in the period, against 458,000 miles the first 20 days of April. These apply to common carrier flights only. If Slick's military flights were included, the load factor would be close to 97%.

Nonskeds have opened a "feederline" along the East Coast, various carriers taking turns operating a twice-weekly passenger service for military personnel, touching almost a dozen military bases, some remote from scheduled airline service.

Capital Airlines officials, disappointed at Northwest stockholders' turn-down of a merger, say the next move—if any—is up to Northwest. Up to the middle of last week the two managements hadn't consulted since the election. Even if the merger is dead, Capital says it won't go ahead with any new equipment buying in the foreseeable future. Financial people say there was some "double-crossing" within NWA involved in the election.

Fairchild people are embarrassed by Rep. O'Konski's attack on the floor of the House against the Kaiser interests. Cyrus Eaton, rather than anyone in the aircraft industry is believed to be an advisor to O'Konski.

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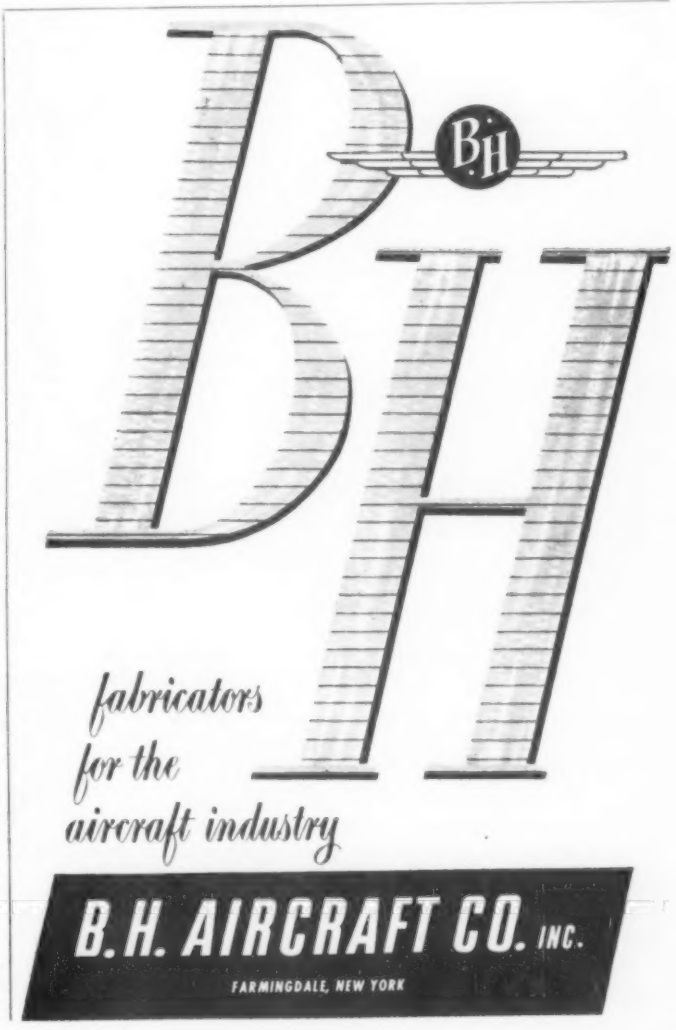

EDITORIAL

No Overconfidence, Gentlemen!

Note to readers:

No editorial today on atrocious conditions in CAA's Office of Aviation Safety. We do thank you CAA employes who have written this past week, however, revealing still more inefficiency. We have more material in preparation, and invite other letters.

In the meantime, Mr. Hensley, don't get overconfident.

Sawyer's Red Herring?

Commerce Secretary Sawyer has come out for letting steamship lines and railroads own airlines. Like so many other Truman administration outbursts, this is a bit puzzling, and badly timed.

The best Washington information we can find indicates there has never been a time in recent years when surface carrier interest in air transportation has been so dormant—if not dead.

Mr. Sawyer should have checked first with the Transportation Association of America. This railroad-inspired group, so heavily weighted with rail representation, is set to issue a report saying there would be no advantage to letting down the bars to surface interests.

Airlines have enough on their minds these days, without having to worry about surplus red herrings from Washington, especially from the Big White Father of the Civil Aeronautics Administration, an agency sworn to promote the best interests of aviation. Or has Chief Sawyer forgotten that CAA is part of his big bureaucratic wigwam?

Saving New Ideas

What is so hard to sell as a new idea?

Aviation's growth has been fantastic. The public thinks of it as dynamic, vibrant, burgeoning. Right. But even in aviation the new idea battles for existence, and the bigger and more costly aviation becomes, the more change and progress costs us.

So one of the penalties of aviation's fast growth has been a spreading astigmatism among its busy leaders, who are too harassed or too poorly advised, or too hidebound, or too conservative, to give houseroom to a new idea.

Recent aviation history is full of examples, and we think it the job of anyone with a healthy dissatisfaction with aviation's progress—as good as it has been—to tick off a few. Some aviation people are coming fearfully close to becoming stuffed shirts and very complacent about things. Nothing could be worse for aviation. We need new ideas. They are our best insurance of progress.

The vast possibilities of the helicopter were written all over the face of the future, for those who would see. But it took a Korean war and its terrible emergencies to bring real military acceptance to the helicopter. Now the industry can't turn out enough to satisfy the warriors.

The history of this country's place in the earliest development of the jet powerplant is nothing to boast about, despite our millions and millions of dollars appropriated for aviation. We are still about seven years behind the British in commercial jet transports. Who can say this won't become eight or nine or ten years?

For months and months an intelligent, pioneering group of individuals has been fighting the Washington battles on inertia, resistance, and confusion to sell a radically new idea in small, medium-speed liaison planes offering amazing slow-landing characteristics, and holding an encouraging outlook for both military and commercial uses. Neither military nor commercial groups show enough interest to give the little ship a chance in these days of billion-dollar appropriations.

The cause of the convertiplane was ridiculed in some very high government places until recently.

The whole aircoach idea is still repugnant to some luxury-minded airline presidents who rail against the nonskeds because they were so "unfair" as to lure nearly a million cash customers—many of them new first riders—in the years 1950 and 1951. Even yet, most of the certificated carriers who have coach services are refusing to promote and advertise them to the limit because they are afraid their luxury services will be hurt!

The idea that air cargo business could be created and sold at unprecedented low rates, and open a tremendous new market to aviation, was literally stuffed down the Civil Aeronautics Board's throat after years of effort by a few pioneers, some of whom were unable to hold on till the certificates were doled out. The Board is still tenaciously blind to air cargo, as witness its recent refusal to grant Seaboard & Western—or any other all-cargo carriers—a trans-Atlantic certificate, even after Seaboard's remarkably efficient record.

For years the Pardel interests have been working on a little-recognized principle of aerodynamics, which its backers feel may revolutionize some aspects of flying. Maybe it will, maybe not. But those who showed even a respectable and polite interest up until recently were a small number indeed.

The idea of a flight safety foundation, proposed for years by Jerome Lederer, was discussed cautiously by industry people for a long time before anywhere near an adequate number of contributions were available to justify a start.

AVIATION WEEK has tried to back some of these "radical" ideas editorially in its short five years. There are others that need support. There always will be.

How can we in aviation take steps to improve our vision? How can we encourage those new ideas that come out of the garage, the back yard, the side street shops, the university classrooms and laboratories? How can we help these inventors detour around the labyrinth of Washington and the complacency of business?

Aviation leaders, as busy as they are with routine daily problems, probably cannot be expected soon to change their attitude that too many new ideas are bothersome. Perhaps what we need is our own Ford Foundation, that will give sober, considered attention to new ideas, and money to those that seem worth developing.

—Robert H. Wood

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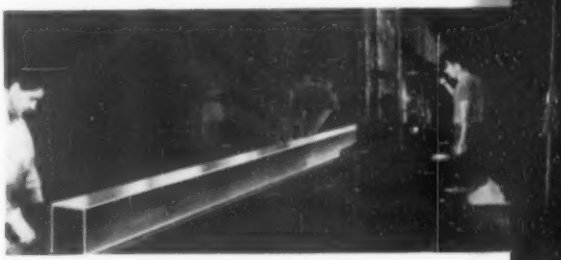

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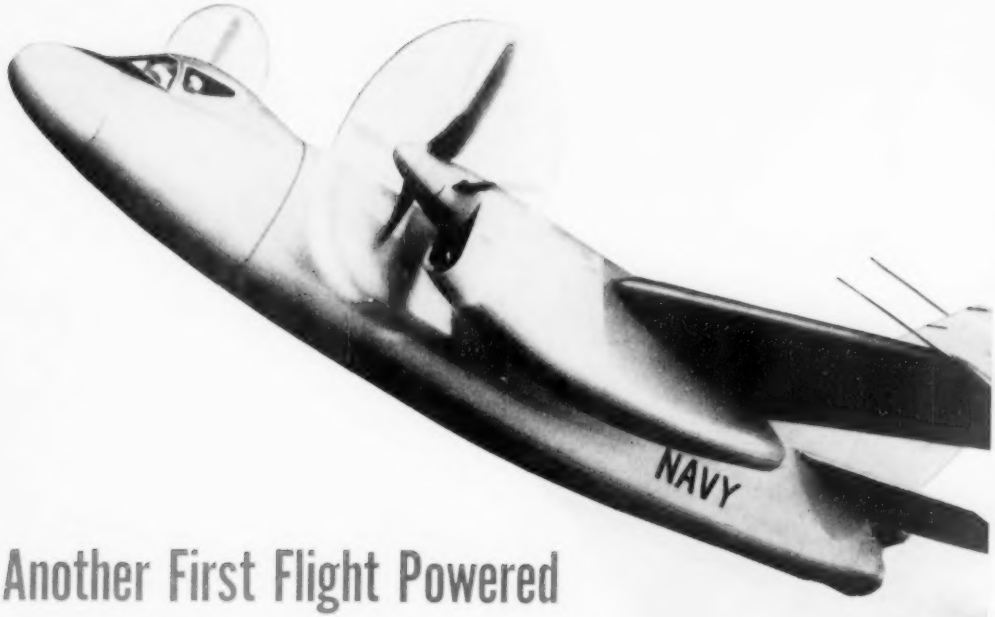

Another First Flight Powered With Allison Turbo-Prop Engines

Again Allison T40 Turbo-Prop engines have powered the first flight of a mighty new aircraft—the North American XA2J-1 Savage. A development from the AJ-1 Savage, now in fleet operation, the new Savage will add punch, speed and range to the attack arm of U.S. Navy aviation.

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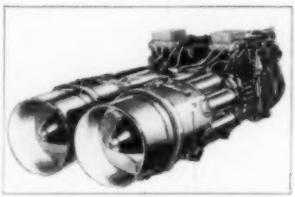

Here is another striking demonstration that, when Allison Turbo-Prop engines replace reciprocating engines, higher power and better aircraft performance inevitably result. Today America has four leading airplanes* flying with Turbo-Prop engines—*all of them powered with Allison T38 or T40 Turbo-Prop engines.*

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